amateur radio

Vol. 37, No. 9

SEPTEMBER, 1969

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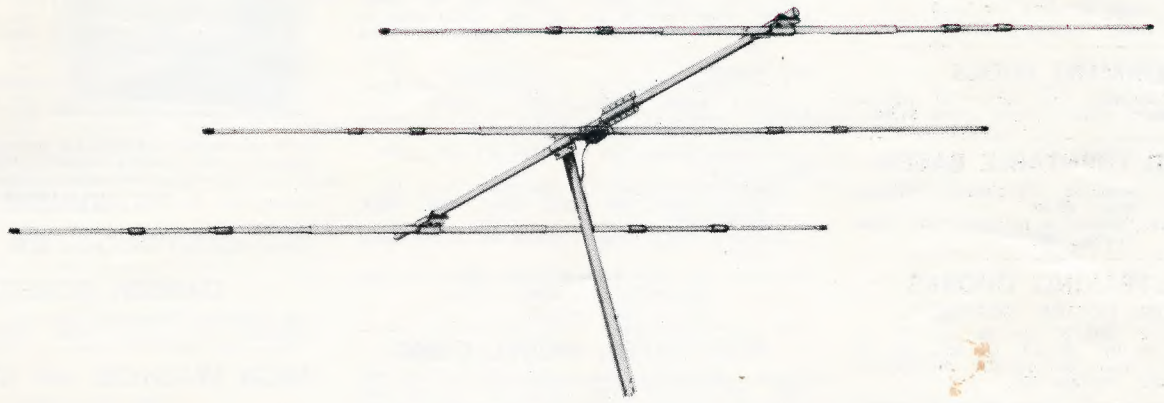
PRICE 30 CENTS



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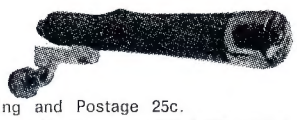

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MODEL K142

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- Input Capacitance: 30 pF. or below (1.5/5/15/50 150v. range). 15 pF. or below (500/1500 range).
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- Accuracy: Within plus or minus 2% full scale.

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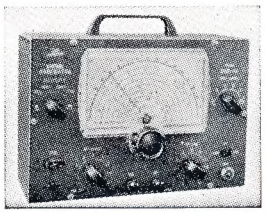

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amateur radio

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COVER STORY

Our cover picture this month shows the "Triple-3" Three-Band Beam for 28, 21 and 14 Mc., produced by J-Beam Engineering Ltd., and available from Sideband Electronics Engineering, Springwood, N.S.W.

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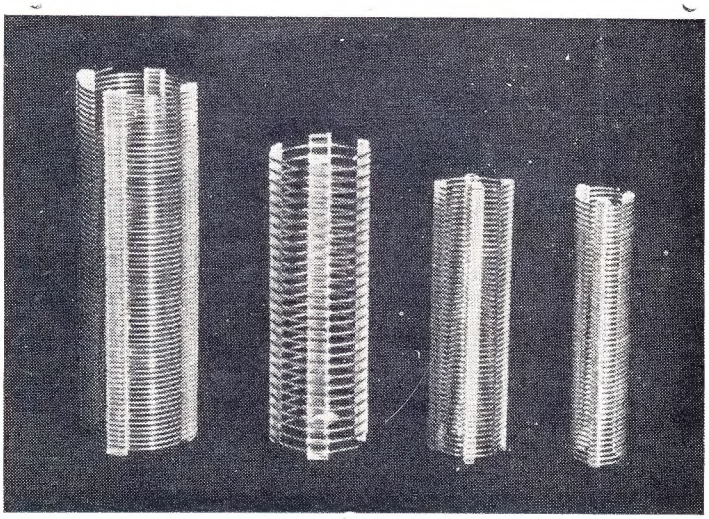

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2-16	5/8"	16	3"	No. 3007	76c
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A question only serious hams should answer...

by Laurie Wade, VK2AQW

How come you are still asking for our obsolete book? The one called "The Care and Feeding of Power Tetrodes". Look, we've already mailed out over 5,000 copies of the thing. It's just got to be in the hands of every amateur who ever went on the air. Don't get me wrong, I'm happy you find it useful. But now you should be asking for our NEW book, "The Care and Feeding of Power Grid Tubes".

It so happens that right now on my desk is a pile of these new books. They're really pretty interesting. You see, one of the fellows on our Eimac staff — Bob Sutherland W6UOV — took it upon himself to incorporate the answers to over 400 questions asked of us over the years. In fact, he has spent just about every spare moment away from his shack, preparing this new book. I couldn't believe that it has almost 200 pages. Bob said he just got carried away. He has expanded the original book, which we published back in '46, so that in its new form it covers all types of power grid tubes in RF and AF service. Even has graphs and things like that.

Now you're probably wondering, where can I get it? Thought you'd never ask. Right this minute there is another pile of these books at our Crows Nest office. Figuring all the time we've spent in getting them ready for you, they're really a bargain at $3.95 each. If it's inconvenient to call at our office, write me, and I'll be happy to post your copy.

In fact, if you are among the first 25 hams to contact me, I'll send you one free. Can't beat that.

Laurie Wade
Senior Marketing Engineer.

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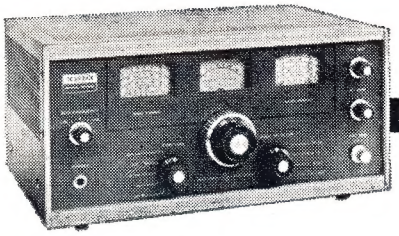
ETD 1269

TRIO

communications receivers and transceivers



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(WITH MECHANICAL FILTERS)

SPECIFICATIONS:

FREQUENCY RANGE: Band A—550-1,600 Kcs.; Band B—1.6-4.8 Mcs.; Band C—4.8-14.5 Mcs.; Band D—10.5-30 Mcs.
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ANTENNA INPUT: 50-400 ohms impedance.
AUDIO POWER OUTPUT: 1.5 watts.
SENSITIVITY: 2uV for 10 dB S/N Ratio (at 10 Mcs.).
SELECTIVITY: ±5 Kcs. at —60 dB (±1.3 Kcs. at —6 dB). When using the Mechanical Filter.
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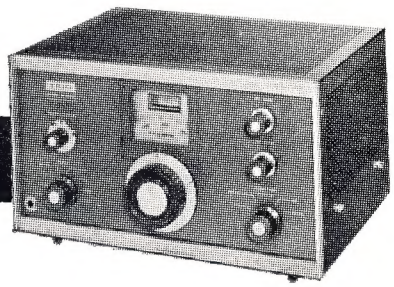
SPEAKER OUTPUT: 4 or 8 ohms.
HEADPHONE OUTPUT: Low impedance.
TUBE COMPLEMENT: V1—6BA6 RF Amplifier; V2—6BE6 Mixer; V3—6AQ8 HF Oscillator; V4—6BA6 1st IF Amplifier; V5—6BA6 2nd IF Amplifier; V6—6BE6 Product Detector; V7a—6AQ8 Beat Frequency Oscillator; V7b—6AQ8 1st AF Amplifier; V8—6AQ5 Audio Output; IN60—AF Detector; IN60, SW-05s—AVC; SW-05s—ANL; SW-05s x 2—Rectifiers. **$175.00 FOR/FOA SYDNEY**

MODEL JR-500SE

AMATEUR BAND COMMUNICATIONS RECEIVER



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MODE: AM, Single Sideband and CW.
SELECTIVITY: Band width ±2 Kcs. at 6 dB down, ±6 Kcs. at 60 dB down. Uses Mechanical filter.
SENSITIVITY: Less than 1.5 microvolts for 10 dB signal to noise ratio.
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TRANSISTORS: Q1—2SC185 Buffer; Q2—2SC185 VFO. **$293.50 FOR/FOA SYDNEY**

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I am proud of having introduced the YAESU-MUSEN FT-200 Transceiver six months ahead of others. It is really a beauty and I realised that already last December before having seen no more than pictures and specifications only. The set was not available for export until now and I had to buy my imports on the domestic Japanese market at a premium. More economical buying now, also of other sets, allows me to pass more savings on to new buyers, just check my price list below.

Everything is sold under standard factory warranty, prices include S.T. and are net, cash Springwood. N.S.W. transportation, postage and insurance are extra. —Arie Bles.

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FT-DX-400 de luxe Transceiver $525
FT-DX-100 A.C./D.C. Transceiver $515
FV-400 second V.F.O. $80
FT-200 Transceiver with A.C. P/Supply $410
FL-DX-2000 Linear Amplifier $240
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External VFO $100
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VOX Unit $30

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TH3JR Junior 3 el. Tri-band Beam $110
14AVQ 10 to 40 Metre 4-Band Vertical $45
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Hy-Gain 3-band 6 el. Cubical Quad $140

MOSLEY

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MP-33 Senior 3 el. Tri-band Beam $120

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CDR Ham-M heavy duty Rotator $165
AR-22R Junior Rotator $60
8-conductor Cable for the Ham-M; yd. 50c

A.C.I.

ACITRON 101 12v. heavy duty D.C. Supply $105

NEWTRONICS

Hustler 4-BTV 10-40 mx 4-band Vertical $55
4-BTV Vertical with 80 mx top-load. coil $70

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The elusive FT-241 Crystals, with fundamental frequencies between 375 and 515 Kc., Channels 0 to 79. A full box of 80 crystals for $17.50 only. Include $1 for parcel postage and handling.

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It all started in 1965 when the Melbourne University Astronautical Society, one of the many student clubs in the University, decided to design and construct an initial "test bed" satellite package. Thus Project Australis was born.

Project Oscar, the American organisation, agreed to negotiate for space on a rocket for an Australian Amateur built satellite as it had done for the American satellite, Oscars I.-IV.

At the Federal Convention in Brisbane at Easter 1966, the University Club sought the support of the W.I.A. This was enthusiastically given, as was $400. The initial difficulties, technical and financial, were overcome and the completed satellite was delivered to Project Oscar officials in California in June 1967. Then the big wait began.

The official projects with which Oscar hoped to "hitch a ride" were themselves postponed and delayed. The chances of Australis becoming an operational reality steadily faded. Then, early this year, a new organisation was formed in the United States, based on the east coast this time, named the Radio Amateur Satellite Corporation or A.M.S.A.T. The office-bearers of A.M.S.A.T., headed by President, Dr. Perry Klein, K3JTE, are professionally associated with the Space Communications industry in the U.S.A.

In brief, the aims of the organisation as expressed in its articles of incorporation are: the provision of satellites for Amateur Radio communication and experiments, encouragement of development of skills and knowledge of Amateur communications and space science, fostering of international cooperation and goodwill by joint participation, facilitation of emergency communication by Amateur satellites, encouragement of extended use of higher frequency Amateur frequency allocations.

A.M.S.A.T. has been able to offer fresh hope that the Australis Oscar A will now be launched and become Australis-Oscar 5. Thus with the support and approval of Project Oscar, the package has been shipped from California to the Washington D.C. area where it is currently undergoing a round of tests by vibration under vacuum at high and low temperatures and tests to ensure that no out-of-band spurious radiations exist that might interfere with official experiments.

A.M.S.A.T. is negotiating with the National Aeronautics and Space Administration (N.A.S.A.) for a "piggy back" launch in the near future. Apart from saying that it is hoped that a launch will occur before the end of this year, it is not at this time to be more precise. One interesting technical point is that the launches likely to be available to A.M.S.A.T. are of a higher altitude than originally planned by Oscar and therefore signals will be weaker by about 6 db. However, the Project Australis group advise that the satellite should be clearly readable by reasonably well-equipped stations. However, they suggest that a low noise converter or preamplifier would be a good investment for stations interested in receiving the satellite. So much for the history and the technical side.

Whilst all this has been going on, earlier this year the Project Australis group approached the Federal Executive of the Wireless Institute of Australia. Whilst originally the group was University based, it has now, with the passage of time, become Amateur based and for all practical purposes, the Project Australis group has become a group in its own right, no longer directly associated wth the University clubs from which it originally came.

As a result of these discussions, and after reference to the Federal Council, Project Australis is to become a Federal activity of the W.I.A. to be known as "W.I.A. Project Australis". The co-ordinator will be appointed by the Federal Council. In other words, in the past, Project Australis has been a group quite independent from the Institute, though encouraged and supported by the Institute. Now it becomes part of the Institute organisation and its policy becomes the ultimate responsibility of the Federal Council. I think this is a very significant and exciting move.

It seems to me to be eminently appropriate for our National Radio Society to directly foster such an important activity as Project Australis.

In the August issue of "Amateur Radio", the agenda for the forthcoming Space Frequency Conference was published. The pressures on v.h.f. and u.h.f. bands caused by the requirements of space communications is rapidly increasing. That the Amateur Service is fully and properly utilising the frequency allocations made to it is one of the more convincing arguments in the Amateurs' claim for the retention of these bands. But what of the future?

A.M.S.A.T. is encouraging the Australian group to go ahead and produce a "follow on" satellite. This, it is proposed, would be a sophisticated communications satellite. This has already been partially planned on the basis that such a satellite will be designed to take a 144 Mc. signal in and re-transmit that signal at 432 Mc. This project is an exciting one. To succeed, it will be necessary for a satellite to be designed and fabricated with a minimum delay. Let us not under-estimate the magnitude of such a project. It is a big project and will require money far beyond any amount that our organisation can itself afford.

I believe that the Institute can play an important part in ensuring the success of this important activity, particularly by providing a firm base upon which the project may continue to grow, and by the provision of an administrative facility that is now much needed. I believe also that the Institute will itself benefit much from this closer association with a very worthwhile object.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

PROJECT—SOLID STATE TRANSCEIVER

PART TEN

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

The Power Supply to be described, although designed to suit the needs of the Project Transceiver, will also run any equipment requiring 12/14 volts d.c. at up to 5 amps. Many of the low- and high-band f.m. and a.m. "Carphones" fall into this category. It can also be used as a very useful general purpose low power supply.

With respect to the power supply's use in the transceiver, the supply needs to have some specific characteristics. It must deliver a minimum of 12 volts and preferably nearer 15 volts. In view of the wide current range encountered—especially on transmit—the supply output voltage should remain reasonably constant, that is, it must have good dynamic regulation. In addition, it should afford some protection to overload. For example, if the p.a. final transistor tries for any reason to draw a destructive current then the supply should "refuse" to deliver such current or, at least, limit the current drawn to a safe value.

The design now described complies with all these requirements. With the output open circuit, the voltage is 15. With a 3 amp. load (roughly the peak value drawn by the transmitter) the output has dropped by only half a volt. The circuit is so designed that the maximum current it will supply is less than that needed to exceed the dissipation of the p.a. transistors. On short circuit this is about 7 amps.

While the supply will not withstand a short circuited output for long periods of time, it is capable of limiting the output current to a safe value for long enough to allow the fuse in the centre tap of the transformer to blow.

Fig. 27 gives the circuit diagram for the complete unit.

A 36 volt centre tapped transformer supplies a full-wave bridge using two BYX38/300 silicon diodes. These diodes are rated at 300 volts p.i.v. and 6 amps. average current drain. Any other diodes of 100 volts p.i.v. or more at about the same current capability can be used. Two 2,000 uF. 35 volt working capacitors form the primary smoothing. At the output of the two capacitors the no-load voltage is 26 and is the input to the regulator/limiter section.

The base of the first regulator transistor, an R.C.A. 2N3053, is held at a constant 16 volts by means of a zener diode. The technique of using an MPF102 as a constant current dropping resistor is the same as that used on the sub-regulator/distribution board described earlier in the project. The emitter of the 2N3053 is directly coupled to the base of the main 2N3055 regulator transistor. Further filtering is provided by the 1,000 uF./25 volt capacitor across the output.

To outline (somewhat sketchily) the limiting action of the supply, assume its output to be short circuited. Such a short circuit could be looked upon as a load trying to draw an infinite current.

At the start of the "short" the 2N3055 will attempt to draw an infinite current, but will be prevented from so doing by the 1 ohm resistor in its collector lead and by the inability of the transformer to supply an infinite current. The drop across the 1 ohm resistor and the concurrent tendency of the supply rail voltage to fall, limits the current that the 2N3055 will pass.

However, the base of the 2N3055 will, unless prevented, try and draw a destructive current, since its emitter is earthed by the applied short. Since the bias supply to the 2N3055 base is, in effect, through the 22 ohm resistor in the 2N3053 collector, the drop across this resistor as the 2N3055 base current attempts to rise, effectively reduces the bias on it to a safe value and protects the regulator device.

POSTSCRIPT

This is the last of the articles describing the main modules of the transceiver. It is proposed, in about two months time, to have a final article which describes alternative uses and/or additions that have come to mind during the past eight or nine months. For the time being, it is hoped that the series of articles has been of interest to readers and that it may have enabled some of them to adopt the ideas contained in the various modules to their own required ends.

AVAILABILITY

The power supply kit, complete with all parts, circuit board and full instructions will be available from early September. It will cost $28.60 plus 20c postage and can be obtained by writing to 4 Elizabeth Street, East Brighton, Vic., 3187.

Now that all the modules have been described any of them are obtainable on request. As indicated in the January 1969 "A.R.," they will continue to be available for at least two years, this availability being subject only to the ability of the suppliers to obtain the specified components. In the event that specific items cease to be manufactured the project organisers will obtain alternate components and detail any changes in circuit constants that may be necessary.

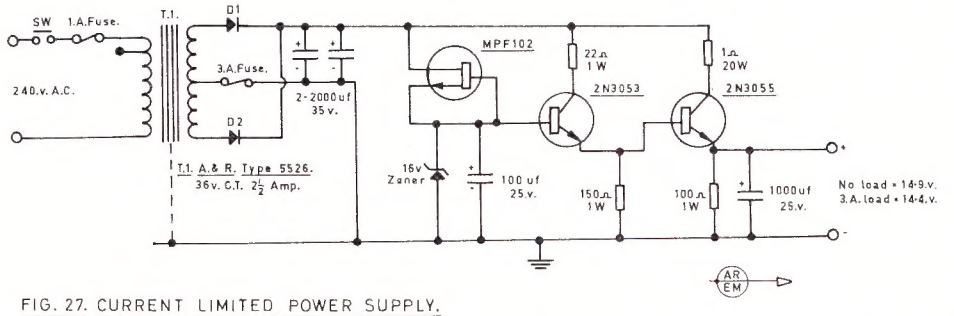

FIG. 27. CURRENT LIMITED POWER SUPPLY.

The emitter resistor of the 2N3053 shows 150 ohms. This should be increased to 1000 to 1500 ohms.

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"Said the Spider in the Sky"*

HOWARD W. KELLEY, K4DSN

"Ideals are like stars, you will not succeed in touching them with your hands, but like the seafaring man on the desert of waters, you choose them as your guides, and, following them, you reach your destiny."—Carl Schurz.

A SPINDLY, ugly, clumsy-looking, insect-like contraption that only the world could love has made its debut. In an age of super-smooth and sleek flying machines, U.S. astronauts will soon be flying an aerodynamic misfit to the moon and back.

The final payoff of the Apollo moon mission is to be carried out aboard the spidery Lunar Module (LM) whose homeliness is offset by its beauty of sophistication and practicality. Though its ability to space-fly is something of amazement about which pages could be written, this discussion is limited to the LM's communication ability.

IN-FLIGHT COMMUNICATIONS

The communications subsystem aboard the Lunar Module is capable of three two-way combinations of in-flight or lunar surface radio links: LM to the orbiting Command Module (CM), LM direct to earth, and LM to the astronauts who are roaming about the moon's terrain.

As in the Apollo, the LM places its communications responsibilities in Unified S-band and v.h.f. equipment.

In flight, when the LM is on the earth side of the moon and separated from the Command Module, communication with earth is handled on S-band, but between the LM and CM information is passed back and forth on v.h.f.

As in the Apollo S-band system a multitude of information sources on the LM can be transmitted and received at the same time, on the same antenna and often on the same frequency. LM-to-earth S-band links contain voice, TV, digital uplink, ranging code signals, biomedical, and systems telemetry data (see Table 3).

S-band voice is the primary means of communication between Mission Control and the two men aboard "Spider" (the voice identifier for the Lunar Module). Backup voice from earth is possible using the digital uplink channel, but this is usually tied up keeping the LM's guidance computer up-to-date.

In response to ranging code signals sent to the LM, the S-band equipment supplies earth stations with a return ranging code signal that enables Mission Control to track and determine range of "Spider".

Biomedical data pertinent to astronaut heartbeat is transmitted by the LM (so earth-bound doctors can monitor and record the physical condition of the spacemen), as is telemetry, voice (using redundant S-band equipment) and, in case voice capability is lost, an emergency key is provided for c.w. communication to the Manned Space Flight Network.

S-band Transmit	2282.5 Mc.
S-band Receive	2101.8 Mc.
V.h.f. Channel A	296.8 Mc.
V.h.f. Channel B	259.7 Mc.

Table 1.—**LM Frequencies.**

Most of the same information can be exchanged between "Spider" and "Gumdrop" (voice identifier for the Command Module) that can be sent directly to earth from the LM. However, these communications are carried out on v.h.f. Normal voice chatter goes out on 296.8 Mc. simplex. Backup is accomplished on 259.7 Mc. simplex. V.h.f. ranging, which is initiated by "Gumdrop" uses both v.h.f. channels as a duplex operation.

When the two orbiting spacecraft are behind the moon, contact with Mission Control is not possible. Simplex voice is maintained over the 296.8 Mc. circuit between "Spider" and "Gumdrop" at this time while telemetry data is fed over channel B into tape recorders aboard the command ship to be stored and re-transmitted to earth at 32-times the original recording speed when radio conditions between earth and space improve.

LUNAR SURFACE COMMUNICATIONS

When the 16-ton Grumman Aircraft Spider has planted its legs into the moon's crust, the orbiting CM will use its S-band system to talk to earth and v.h.f. to maintain communications with the astronauts who are on the lunar surface. The Lunar Module then becomes the world's most expensive f.m./a.m. repeater. The LM takes the v.h.f. voice, converts it to S-band and re-transmits it to the space network of earth receiving stations.

Should v.h.f. between the moonbound astronauts and the command ship not be satisfactory, earth stations may act as repeaters by re-transmitting S-band from the moon back into space to the CM.

TELEVISION

LM-to-earth capabilities from the moon are the same as in-flight except that, in addition, TV may be directly transmitted to earth from the lunar surface. In fact, one of the first assignments of the LM crew, after checking for landing damage, is to erect a 10-foot 2200 Mc. parabolic antenna.

The television system has a much more utilitarian use than just to show earthlings the spectacle of man's first step on a foreign planet. It will provide the closest, most exacting view thus far of the moon's topography for instant evaluation by scientists in Houston. These same scientists can advise the spacemen which rocks to pick up and bring back, which features are important, and which way to point the camera. There are also plans to set the camera on a tripod a distance away from the LM so that we on earth can see the actual blast off from the moon when the job is done and Spider returns to space for a rendezvous with the mother-ship. The television transmitter is located in the base section (descent stage) of the LM—the part that stays behind.

The small-hand-held TV camera designed for the Apollo programme weighs only 4½ pounds. It has a bandwidth of 10 cycles to 500 Kc. and scans 10 frames per second (f.p.s.) at 320 lines and 5/8 f.p.s., 1280 lines. The 1-inch vidicon consumes about 7½ watts of power.

PLSS—PRONOUNCED PLISS

The well-dressed astronaut who strolls along Lunar Lane wears upon his back an all important unit known as the PLSS—Portable Life Support System. The PLSS is a self-contained, self-powered rechargeable environment self-powered rechargeable environmental control system. For four hours the back-pack supplies pressurised oxygen, cleans and cools the expired gas, circulates cooling liquids, and contains a transmitter for biomedical information and a dual v.h.f. transceiver for communication.

The PLSS has a contoured fibreglass shell to fit the astronaut's back, and a thermal micrometeoroid protective cover. It has three control valves, and, on a separate remote control unit, two control switches, a volume control, and a five-position switch for the dual v.h.f. transceiver. The remote control unit rests on the chest.

The astronaut has available to him primary and secondary duplex voice communication, and physiological and environmental telemetry all of which must go through the LM to the CM on v.h.f., then from the CM to earth on S-band. The v.h.f. antenna for the PLSS is permanently mounted on the oxygen purge system. Two side-tone generators over-ride incoming audio in the headphones to notify of low pressures or low fuel reserve.

* Reprinted from "CQ," June 1969.

Freq. (Mc.)	Vehicle	Mode	Information
2287.500 secondary	CM	PM	Voice, tracking/ranging, data
2282.500 transmit	LM	PM/FM	Voice, TV, tracking/ranging, data
2272.500	CM	FM	TV, data
2106.400 primary	CM	PM	Voice, tracking/ranging, data
2101.800 receive	LM	PM	Voice, tracking/ranging, data
296.800 Ch. A	CM/LM	AM	Voice, CM to LM, EVA, data
259.700 Ch. B	CM/LM	AM	Voice, CM to LM, data
243.000	CM	AM	Recovery beacon
10.006	CM	SSB	Backup h.f. recovery link

CM—Command Module of Apollo.
LM—Lunar Module.
EVA—Extra Vehicular Activity.

Table 2.—**Frequency Chart of Apollo/Lunar Module.**

R.F. EQUIPMENT

In several respects, r.f. equipment on the LM is much like that on its big brother Apollo. (Note: Unlike military ships, astronauts don't refer to their spacecrafts as "she", but rather "he".) The S-band assembly consists of two identical phased-locked receivers, two phase modulated (p.m.) transmitters (0.75 watt output) with driver and multiplier chains, and a frequency modulator (f.m.). The receivers and phase modulators provide the ranging, voice, emergency c.w., and telemetry transmit-receive functions. F.m. is primarily used for video transmission, but accommodates pulse-code-modulation telemetry, biomedical, and voice transmission. F.m. also provides limited backup for both p.m. units.

When more r.f. is required amplifiers can be brought into play. This assembly consists of two amplitrons (primary, 18.6 watts output; secondary, 14.8 watts output), an input and output isolator (ferrite circulators), and two power supplies all mounted on a common chassis. The r.f. circuit is a series interconnection of the isolators and amplifiers. The amplifiers themselves (which are saturated, rather than linear) are broadband and exhibit high efficiency, high peak and average output power, but relatively low gain. The isolators protect both amplifiers and both S-band transmitter driver and multiplier chains. The isolators exhibit minimum isolation of 20 db. and a maximum insertion loss of 0.6 db. Only one amplifier can be activated at a time and when neither amp. is selected, a feedthrough path through the power amplifier exists with a maximum insertion loss of 3.2 db.

V.H.F. EQUIPMENT

Although the Apollo relies heavily on its S-band capabilities, the Lunar Module is oriented toward v.h.f. This equipment consists of two solid-state superhet. receivers and two 5-watt a.m. transmitters. One transmitter-receiver combination operates on 296.8 Mc. (Channel A), the other on 259.7 Mc. (Channel B), for simplex or duplex voice communications. Channel B may also be used to transmit pulse-code-modulation (p.c.m.) data from the LM to the CM at a low bit rate and to receive biomedical and space suit data from the astronauts who are outside the ship on the moon.

SIGNAL PROCESSOR

The signal processor unit is the common acquisition and distribution point for most received and transmitted information, except that low bit rate split-phase data are directly coupled to v.h.f. Channel B and TV signals go directly to S-band f.m. The signal process or assembly processes voice and medical information and provides the interface to the proper r.f. generator, tape recorder, modulator, or computer.

This signal processor includes an audio centre for each astronaut and a premodulation processor where information is switched, mixed and modulated. It also has a repeater function so that v.h.f. received signals can be retransmitted on S-band.

The two identical audio centres provide individual selection, isolation and amplification of audio received or transmitted from the LM. Each centre includes a mike pre-amp., headset amplifier, VOX circuit, diode switches, audio gain controls, and an intercom system.

DIGITAL UPLINK

The digital uplink assembly decodes 2101.8 Mc. commands from earth and routes the information to the LM guidance computer. It also provides a verification signal to the pilots that the equipment has in fact received all the needed information from earth and got it in fine shape. However, if for some reason the computer doesn't get all the information it wants or it suspects some of it of being wrong, it will signal through the S-band transmitter "no-go" and ask for a repeat. The uplink commands addressed to the LM parallel those inputs available to the LM guidance computer via the display and keyboard accessible to the spacemen. The digital uplink assembly also provides another means of voice-backup if the received S-band audio circuits in the premodulation processor fail.

RANGING TONE TRANSFER

The ranging tone transfer unit operates with v.h.f. receiver B and v.h.f. transmitter A to provide a transponder function between the command and the moon vehicle. The v.h.f. ranging tone input is made up of two acquisition tone signals and one track tone signal. Accurate ranging is accomplished when the track tone signal from the CM is received and re-transmitted from the LM.

ANTENNAS

The S-band steerable antenna is a 26-inch diameter parabolic reflector with a point source feed that consists of a pair of cross-sleeved dipoles over a ground plane. Primarily this antenna provides deep-space voice and telemetry communications and deep-space tracking and ranging. This radiator functions over 174 degrees azimuth and 330 degrees elevation coverage and can be operated manually or automatically. Initial positioning is done manually to

(Continued on Page 17)

Information	Freq. or Rate	RF Carr'r Modulat'n	Subcarr'r Modulat'n	Subcarr'r Freq.
Receive: 2101.8 Mc.				
Voice	300 to 3000 cy.	PM	FM	30 Kc.
Voice Backup	300 to 3000 cy.	PM	FM	70 Kc.
Ranging Code	990.6 kilobits/sec.	PM		70 Kc.
Uplink Data	1.0 kilobits/sec.	PM		70 Kc.
Transmit: 2282.5 Mc.				
Voice	300 to 3000 cy.	PM or FM	FM	1.25 Mc.
TV	10 to 500 cy.	FM baseband		
Biomedical	14.5 kc. subcarrier	PM or FM	FM	1.25 Mc.
Lunar Surface Unit	3.9, 5.4, 7.35, 10.5 kc. subcarriers	PM or FM	FM	1.25 Mc.
Voice	300 to 3000 cy.	PM baseband		
Biomedical	14.5 kc. subcarrier	PM baseband		
Lunar Surface Unit	3.9, 5.4, 7.35, 10.5 kc. subcarrier	PM baseband		
Voice Backup	300 to 3000 cy.	PM baseband		
Ranging Code	990.6 kilobits/sec.	PM		
Emergency Code	Morse Code	PM	AM	512 Kc.
Pulse-code-mod. non-return zero	High bit rate: 51.2 Low bit rate: 1.6	PM or FM	Phase Shift	1.024 Mc.

Table 3.—**Lunar Module S-band Capabilities.**

Useful Circuits Using Computer Board Transistors

RON BROWN,* VK7ZRO

In the August issue of "A.R." was presented a set of characteristics of transistors from I.B.M. computer circuit boards, showing typical values, with some indication of the spread of values to be expected. Although there may be some similarity between the transistors and certain commercial types (e.g. 2N1300 series for 033, 083, etc.), it is definitely undesirable to make any definite use of such similarities, because the evidence shows too wide a variation of some of the characteristics of the computer transistors compared to the commercial ones.

The data hinted, but did not state, an interesting fact: the computer transistors are high quality items, likely superior to the "general purpose" germanium types generally available commercially. They are usually characterised by low leakage, low noise, and adequate gain—depending on type, of course. The power transistors (in the TO-3 case) have remarkable voltage and gain ratings, with good linearity, and a healthy frequency rating.

The circuits presented here use some of the transistors from computer boards. Even though satisfactory performance has been obtained, it may be necessary to experiment further to obtain optimum results, depending on individual components. It will, in most cases, be possible to use transistors from the boards, other than those specified, but the previously presented data should be consulted first. Special attention, for example, should be given to the difference between the alloy junction (e.g. 033, 083) types with modest frequency response, the alloy diffused (e.g. 015, 065) types with high frequency response but low BV_{EBO}, and the mesa types (e.g. 102, 152 with TO-18 case) having very good frequency response but quite low collector voltage ratings.

* 215 Carella Street, Howrah, Tas., 7018.

A TUNING FORK OSCILLATOR

This little oscillator was devised to enable the YF to tune her violin.[1] See Fig. 1.

The fork used is a British Standard "A" (440 c.p.s.) which costs about $1. Reference should be made to previous articles in "Electronics Australia"[2] and "Amateur Radio"[3] for details of mounting. Remember, however, that the fork must be mounted rigidly with respect to the earpieces. The circuit of Fig. 1 is self-explanatory.

T1 and the speaker could well be replaced by a two-inch speaker and appropriate transformer (1 to 2K primary impedance). R1 should be adjusted so that oscillation is maintained at just below clipping level.

The unit has now been operating quite successfully for several months. Output is quite loud enough for violin tuning, and frequency shift (checked against WWV) is undetectable.

1—Reasons: No piano and I got tired of having QSOs interrupted by the YF wanting to listen to WWV.
2—Jeffcoat, K., "A Tuning Fork Frequency Standard," "Radio, Television and Hobbies," Oct. 1961, p. 28.
3—VK3PB, "RTTY the Easy Way," "A.R.," Nov. 1967, p. 8.

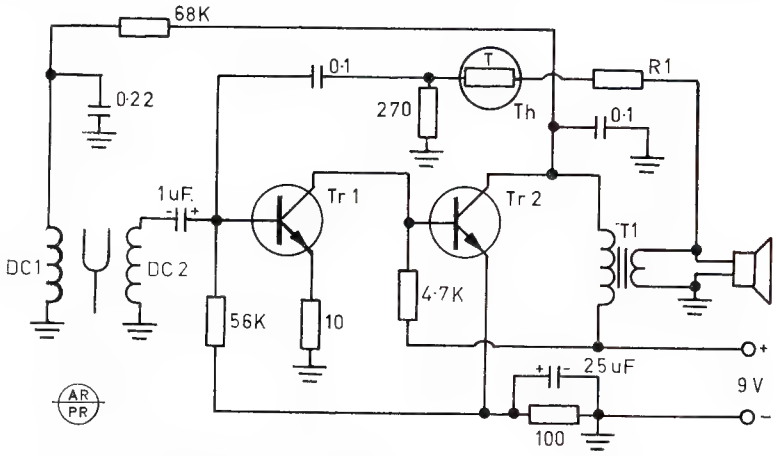


FIG. 1. TUNING FORK OSCILLATOR

TR1, TR2—083, or 034 (or 033) if supply polarity reversed, as well as polarity of C2 and C3.
Speaker: Earpiece from BC611, or similar.
T1—Output transformer from BC611, or similar. Rewound with half the number of primary turns.
TH1—S.T.C. Thermistor, type R23.
R1—Between 1K and 2K, see text.
DC1 and DC2—Drive coils for fork. These consist of two high impedance headphones (complete), mounted 1/16 inch from each fork tine.
C1—To resonate with DC1 at operating frequency.

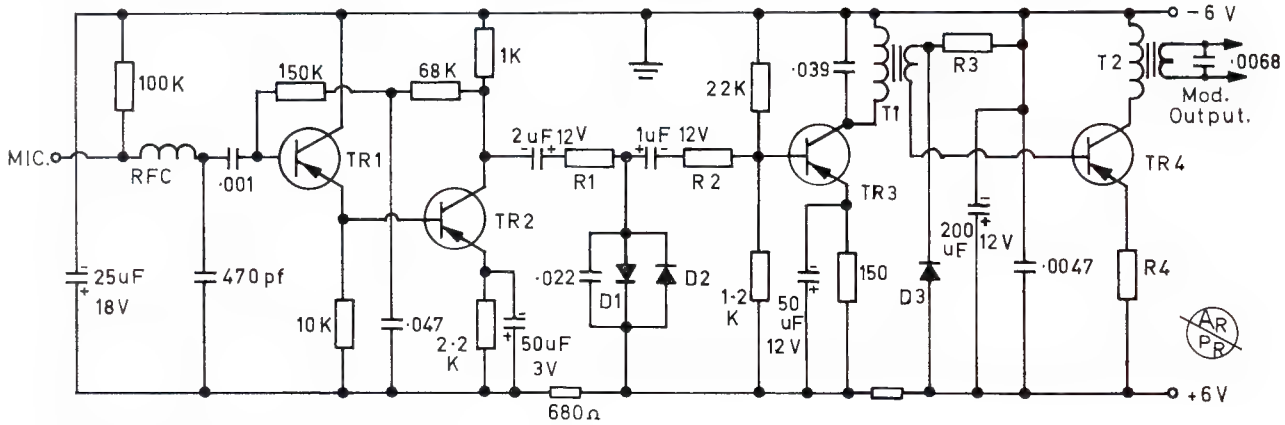


FIG. 2. A 3·5 WATT MODULATOR

Capacitances in uF. if not indicated specifically.
D1, D2, D3—Silicon diodes from boards; see text.
R1, R2, R3—See text.
R4—¼ ohm wire; see text.
T1—Driver transformer; see text.
T2—Modulation transformer; see text.
RFC—56 uH. from circuit boards.
All other values uncritical.
TR1, TR2, TR3—033 or 034.
TR4—AT1138, 036, or 042.

3½ WATT MODULATOR

Fig. 2 shows a transistor modulator which has now been in use for 18 months in a 6 metre mobile; the final valve is a 6DL5.

The unit operates from a 50K ohms dynamic microphone. R1 adjusts the drive level to the clipper diodes, D1 and D2, which are silicon diodes from the computer boards,[4] and matched for equal forward voltage at 5 mA. forward current.

Due to the low output voltage of the microphone used by the author, R1 was not required. R2 adjusts the modulation level.

T1 was wound for the job, but it should be possible to find a commercial unit, such as the ones used in car radios. T2 is an ordinary 3.5 ohm to 5K ohm speaker transformer with the 3.5 ohm winding re-wound with the heaviest wire practical, and arranged to match 3 ohms. It is most important to connect the two windings of T2 so that the two d.c. magnetising components tend to cancel. Under these conditions the paper air gap spacer in the transformer may be removed.

The collector current of the AT1138 is adjusted by varying R3 until I_c = 1.8 amps. If this requires reducing R3 below about 35 ohms, try a different diode for D3. R4 is obtained by using an appropriate length of copper or resistance wire, calculated from the wire tables, or by finding the ohms per foot from a long piece which gives a reasonable reading on an ohmmeter.

R3 and D3 form a voltage divider of the usual sort to bias the base of the AT1138, but D3 also provides a measure of temperature compensation; ideally D3 ought to be germanium to balance the characterstics of the output transistor, but that would require a bit of experimenting about the values of R3 and R4 for optimum results. R4 gives some negative d.c. feedback to reduce tendency to thermal runaway, and some negative a.c. feedback to improve quality.

If you have an 036 or 042 from the computer board, you can use it in place of the AT1138. Or inexpensive transistor types OC26, etc., can be obtained.

If a very low-Z microphone is used, a common base pre-amplifier of conventional design would be appropriate.

4—These are the miniature glass-capsule type common on the boards, but some of them are silicon, and some are germanium. An easy way to tell the difference between them is to measure the forward resistance with an ohmmeter and compare it with that of a diode known to be silicon. Also works for transistors.

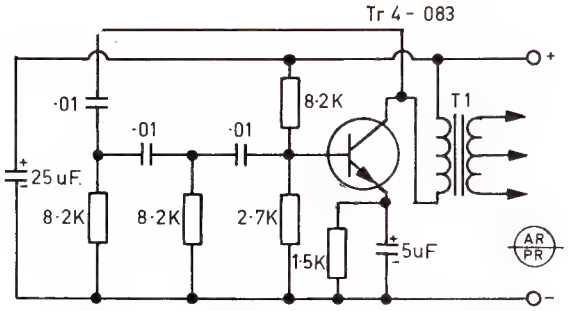


FIG. 4. PHASE SHIFT AUDIO OSCILLATOR FOR FOX HUNTS.

TWO METRE TRANSMITTER

Although it is very simple, this little transmitter gives very good results, considering that the input power is only 250 mW. It has been built in two versions:

(a) As shown in Fig. 3, and (b) with the audio driver as a phase shift oscillator (Fig. 4) for a fox-hunt transmitter.

T1 is an OC71 to 2 x OC72 driver transformer, while T2 is an OC72 output transformer with the secondary replaced by a centre tapped winding of about the same number of turns as the primary. The heaviest wire possible should be used, consistent with space available on the former. When replacing the laminations, place all of the E's together so that a small air gap will be formed.

If it is desired to avoid the use of a tapped transformer, an ingenious alternative system is possible with two diodes, as described on p. 96 of "Transistor Transmitters for the Amateur," by Don Stoner. It is also described on p. 170 of "E.E.B." for Dec. 1967, with improvements.

Some trouble was experienced with transistor break-down in the 2B8 driver when modulation was applied; to avoid this, it was necessary to select a transistor with a high BV_{CES}.[5] A small heat sink used on the driver may increase the reliability of the TO-18 types, because voltage rating decreases with temperature. If you don't have any luck, replace it with a 2N3646 or equivalent. The Fairchild types do not appear to have impressive voltage ratings, but the fact is that the actual ratings may be as much as 100% higher than published.

The 2B8 and 193 types are TO-18 planar transistors, characterised by high f_T. The 150 series has low BV, so would be hopeless for this application, though excellent in receivers and other LT locations. The 065 and 066 are excellent TO-5 transistors having high BV and good gain at h.f., but with f_T of the order of 75 Mc.; 48 Mc. would be asking rather a lot from them in common emitter configuration. They could well be worth trying as common base, in driver and/or final.

A shield must be placed across the final transistor (between base and collector), and the input and output cir-

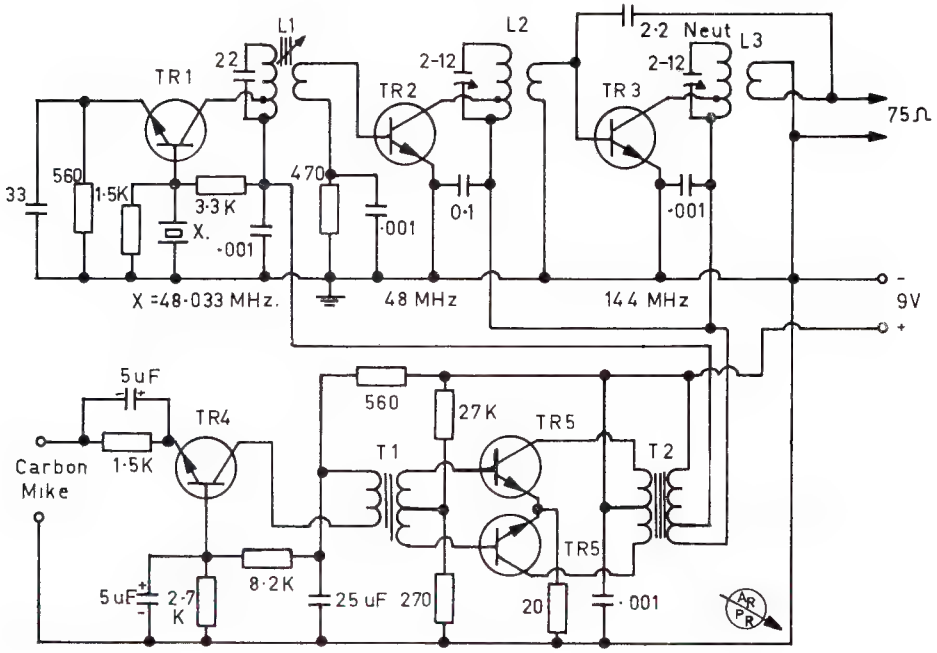


FIG. 3. TWO METER TRANSMITTER P.in. 250 mW

TR1, TR2—2B8 or 2N3646.
TR3 –2N3646.
TR4—083.
TR5—071, 086.
T1, T2 See text

Coils: All wound with 18 s.w.g. tinned wire.
L1 –9 turns ¼ inch slug, ½ inch long, tap at 4½ turns, link 1 turn in centre.
L2 3½ turns 3/8 inch diam., 3/8 inch long, tap at 2¼ turns, link 1 turn.
L3 –Same as L2 but tap at 1½ turns

5 –The 193 series is also worth trying. Note that the resistance in the base of the driver is low, so that for all practical purposes, BV_{CER} equals BV_{CES}.

cuitry well isolated from each other. Good bypassing and short leads are imperative; thus, although the 0.1 uF. and 0.001 uF. by-pass condensers of driver and final are shown separated on the diagram (Fig. 3), the compact geometry used on a printed circuit board (not shown) resulted in the two being very close together.

The neutralising of the final (if it proves necessary) is simple but effective, and is adjusted by varying the value of the 2.2 pF. condenser for best stability. The output link must be phased correctly. Neutralisation of the final will probably be required if a transistor with low f_T is used.

With compact geometry and the components shown in Fig. 3, the transmitter was stable and performed well. The current literature[6] is, however, full of warnings about dire effects of transients or parasitics, and might be worth consulting if trouble is encountered. Various cures are offered.

The unit was built on a circuit board about 2½" x 3". It was combined with an audio output stage (as shown in Fig. 5) and a super-regenerative receiver to make a small hand-held transceiver.

LOW POWER CLASS B COMPLEMENTARY SYMMETRY AUDIO OUTPUT STAGES

The idea of using circuit board transistors and disposals high impedance speakers had, for some time, appealed to me as an economical way of making low power audio output stages. In fact it proved possible to build one, complete with speaker, for less than $4.

Fig. 5 shows the details. For best results, TO-5 high current (300-400 mA. rating) transistors from the boards should be used. These are:

PNP: 030 and 026.
NPN: 086 and 071.

Mine were matched on a Kyoritsu tester for h_{FE} and β within 20%. Even though the 086 should be a better match for the 030 than the 071, it was hard to find 086 mates for the 030s, so 071s were used.

The pre-amplifier transistor can be any of the PNP TO-5 types (034, etc.), but note that I used transistors with β greater than 130; I suggest you do the same.

I commenced the design with a mathematical approach (Ref.: T. Davis, "Miniwatt Digest," Vol. 2, No. 4, p. 54-59), but I tired quickly, and adopted a more practical approach. I decided that the 030 was sufficiently similar to the AC132 to try direct substitution in already published designs (Ref.: "Miniwatt Digest," Vol. 3, No. 3, p. 38-44) and to make any modifications required, by trial and error. The final design with layout, is shown in Figs. 5, 6 and 7.

After wiring, check, and switch on. Measure the voltage, V_A and the collector current of the 030. V_A should be as given in Table 1, and the collector current should be between 1 and 3 mA. If not, adjust R4, or if a c.r.o. is available, adjust for equal positive and negative clipping at maximum output. For best results, R3 will also need slight adjustment.

With the low voltage versions, power dissipations should be acceptable at normal ambient temperatures, but with the 18v. version small heat sinks should be fitted. These can be made easily by cutting 1" lengths of aluminium tubing from an old t.v. aerial and pushing them over the transistors (for tight fit).

6—Recent issues of "QST," "Ham Radio" and Australian "E.E.B."

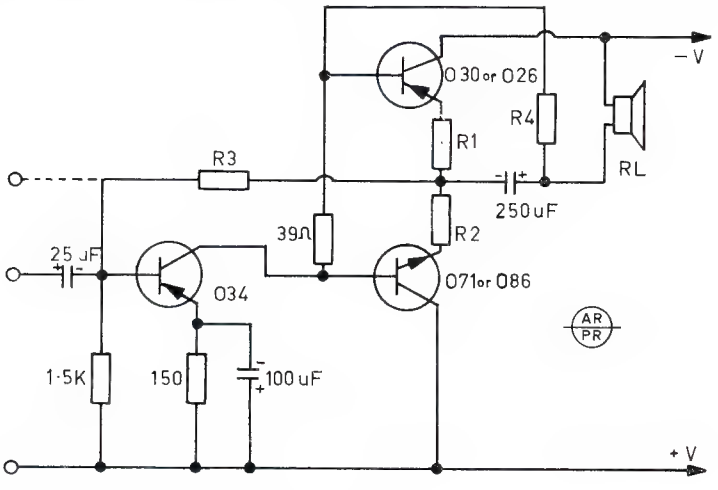


FIG.5. LOW POWER AUDIO AMPLIFIER.

Voltage, E Volts	R_L Ohms	P_O* mW.	V_A Volts	R1, R2 Ohms	R3 Ohms	R4 Ohms
6	8	130	3.6	3.9	4.7K	470
9	15	300	4.9	3.3	6.8K	820
12	27	450	6.8	2.7	5.6K	560
18	33	700	10.0	1.5	9.1K	1000

Input Impedance: Approximately 30 ohms at 1 Kc.
Frequency Response: 3 db. down at 250 c.p.s. and 150 Kc.
* Power output at the onset of clipping (at 1 Kc.)

Table 1.

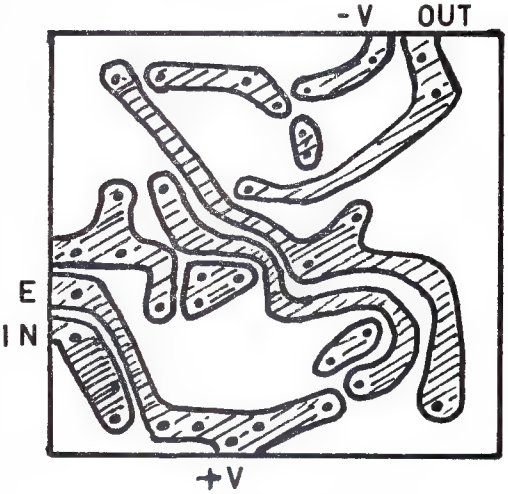


FIG. 6.—BOTTOM VIEW (Actual Size).

As it stands, the circuit has a large amount of a.c. feedback from V_A to the base of the 034 via R3. If this is undesirable for your application, it can be removed by dividing R3 in two, and by-passing the centre. The low frequency cut-off point of 250 c.p.s. is limited by the 25 uF. condenser; if you want lower frequency response, increase its value.

All units performed satisfactorily, except that there was a small amount of crossover distortion with the 6-volt version.

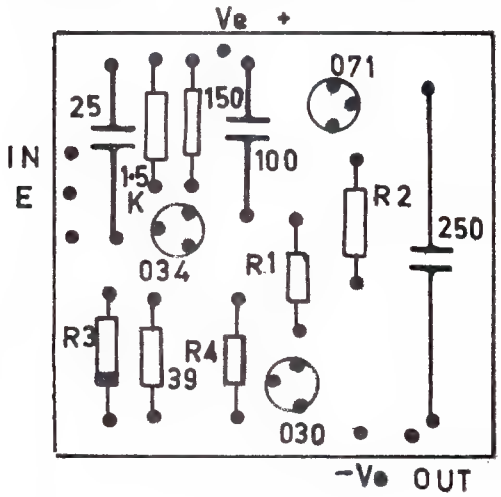


FIG. 7.—TOP VIEW (Actual Size).

DIODE SWITCHING A REMOTE CONTROLLED 3-CHANNEL 6 METRE MOBILE

Due to the fact that my 6 metre mobile is remote-controlled, the addition of two extra channels presented

quite a problem. Relays and step switches were considered, but in the end it was decided to try diode switching, mainly due to cost.

My first attempt used 100K resistors from the h.t. line but not all crystals could be made to oscillate reliably, because the r.f. rectified by the diodes probably tended to turn the crystal off. Increasing the "on" current to the diodes to about 40 mA. each solved the problem, but the h.t. power supply was unable to provide the extra 80 mA. needed. This was solved by supplying the diodes from the l.t. line (6v.). This turned the crystals on reproducably, but resulted in interaction between the two sets of crystals by coupling through the low resistances used. The final method isolated the two sets of crystals with r.f. chokes, as shown in Fig. 8.

Due to the fact that there is a large amount of circuitry at grid potential, it is necessary to be careful with the layout and shielding. For the same reason it is inadvisable to use more than three sets of crystals. The 56 μH. chokes might be larger, but they were readily available from the computer boards (green body, colour coded; or brown body, lettered); occasionally larger chokes may be found on the boards.

For 12v. supply, increase the values of the 82 ohm resistors to 180 ohms or 220 ohms; incidentally, the 82 ohm resistors also came from the boards. 50 mA. might seem on the high side for the germanium diodes, but as this unit has been working for nearly 12 months, this current level can be regarded as satisfactory. As Leo VK7RG points out, if this was too much current the diodes would not take it for long. It is worth noting that if a germanium diode does not get more than moderately warm, it will take a given current indefinitely at a given room temperature. For the same reliability a silicon diode can get hot enough to hurt the touch. Be sure you know which is which **before** you start (see reference 4).

I wish to thank R. L. Gunther, VK-7RG, for his assistance in preparing this manuscript.

Silver Plating of V.H.F. Inductances

A. S. LUNDY, VK2ASI*

Reference is often made to the use of silver plated inductances above about 50 Mc., but unfortunately the average Amateur has the problem of getting small "one off" jobs done.

VK2ASI has been plating his v.h.f. inductances for several years now since building a 2 metre a.m. portable rig for a field day. This rig used a final that required 3 mA. of grid current across a 15K grid resistor. Upon firing up the rig, the usual 2 metre problem arose—not enough grid drive. In fact, only 2 mA.! 1 mA. short. What to do? The inductances were wound with bare copper wire, so three coils were removed, one at 48 Mc., and two at 144 Mc. from the driver stages. These were silver plated and then installed back into the rig and, without any alterations to the circuit, except for a slight retune, 3 mA. of grid current was obtained. Success!—and now how to get it.

An essential requirement in silver plating is that the electrolyte used must contain a very low concentration of silver ion. A solution of silver nitrate for instance would be unsuitable, as all the silver would be present as silver ion. This would cause the silver plating to be non-coherent and it would flake off.

The electrolyte of choice is Potassium Argentocyanide solution. In this solution the argentocyanide ion is in equilibrium with only a very small amount of silver ion, hence the concentration of the silver ion $Ag+$ is low, nearly all the silver being present as argentocyanide ion $[Ag(cn)_2]-$.

To prepare the Potassium Argentocyanide solution dissolve 17 grams of silver nitrate in about 200 Mls. of distilled water or rain water, and 6 grams of sodium chloride in 100 Mls. of water. Upon mixing these two solutions, a white curdly precipitate of silver chloride will form and settle to the bottom as a coherent mass. Decant the excess water off and wash the precipitate twice by adding 200 to 300 Mls. of water and decanting.

The silver chloride is quite heavy and no trouble should be experienced in keeping it at the bottom while decanting. Add about 300 Mls. of water to the precipitate and leave where it will not be in direct sunlight or it will decompose.

Now dissolve 14 grams of Potassium Cyanide in 200 Mls. of water and add about three quarters of it to the silver chloride, most of which will dissolve. Add small amounts of the cyanide solution to the silver chloride with stirring until all the silver chloride has just dissolved. Dilute to about 1 pint which should be sufficient for most jobs. **The solution is extremely poisonous. All possible care must be taken with it.**

The work to be plated is made the cathode of the electroplating cell (negative voltage applied to it) and the anode is a piece of silver of at least 95% purity and about one inch square. A voltage of 6 to 12 volts at a current of 1 to 2 amps. is required, depending on the size of the object being plated. Too high a current will cause an effervescence at the work and the silver plating will be porous and will rub off. If this occurs, the current must be reduced either by lowering the voltage or if this is fixed (I use a battery charger) by increasing the distance between the work and the anode.

Silver ions are discharged at the object being plated, while cyanide ions are discharged at the silver anode. These combine with the silver to form silver cyanide which then dissolves back to potassium argentocyanide. This means that the electrolyte never "wears out", silver is simply transferred from the anode to the work.

* 36 Otho Street, Inverell, N.S.W., 2360.

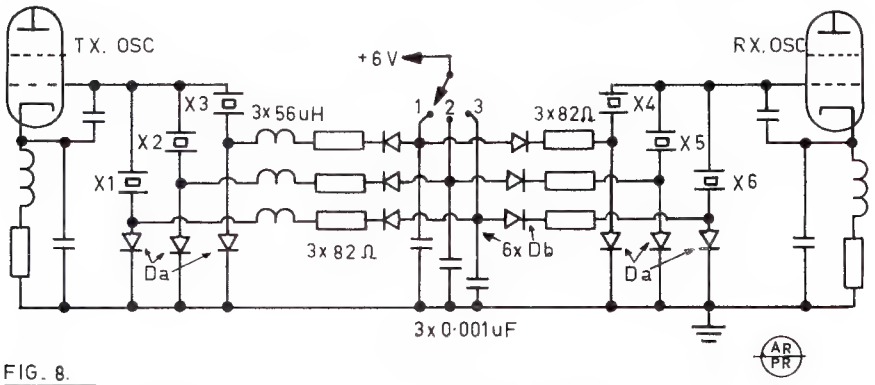


FIG. 8.

Switch Position 1—52.830 Mc.
2—53.032 Mc.
3—53.100 Mc.
Da Germanium diodes from circuit boards.
Db—Silicon diodes from circuit boards.
X1 5900 Kc., FT243.
X2 5892.5 Kc. FT243
X3—5870 Kc., FT243.
X4—5443 Kc., FT243 (for 1600 Kc. i.f.)
X5—5463.2 Kc., FT243 (for 1600 Kc. i.f.)
X6—5470 Kc., FT243 (for 1600 Kc. i.f.)

Unmarked components are original transceiver components.

LEBANESE DX CONTEST

The Lebanese Amateur Radio Association (R.A.L.), in co-operation with the Lebanese Ministry of Tourism, Middle East Airlines Air-Liban, and the Cadmos Hotel, announces a special DX Contest commemorating its 20th Anniversary.

Contest Period: 0001 GMT, 4th October, 1969. through 2359 GMT, 12th October, 1969.

Procedure: An OD station may be worked only once per band for credit (c.w. or phone), but may be worked on additional bands for additional point credit.

Points: Contacts from Europe, Africa, and Asia count one point on 10, 15 and 20 metres; two points on 40 metres; and three points on 80 metres.

Contacts from North and South America, Oceania, and Antarctica count two points on 10, 15, and 20 metres; four points on 40 metres; and six points on 80 metres.

Scoring: Final score is the total of points on all bands.

Logs: Submit list of contacts with date and time in GMT, band, and points claimed to: R.A.L., P.O.B. 1217, Beirut, Lebanon. Mailing deadline is 1st November, 1969.

Prizes: Grand prize of air tickets for two to Beirut from any point on the M.E.A. route plus a free double room at the Cadmos Hotel in Beirut for one week. Both good any time during the period 1st March through 31st August, 1970.

The high scorer on each continent will be awarded a silver cup, and the high scorer in each country and U.S. call district will be awarded a special certificate.

Design of a Three-Band Beam for 28, 21 and 14 Mc.

B. SYKES,* G2HCG

EXPERIMENTING with antennae can be lots of fun, but when the final design must be suitable for mass-production and eventual use in all parts of the world, in all climatic conditions, the fun element tends to disappear. Nevertheless, the story of the problems involved and the methods used to achieve final success can still provide entertainment especially as, regardless of the amount of laboratory work involved, the final tests must be "on the air".

REACTANCE COMPENSATION

The basic objective was to produce a three-band beam with a performance on each band as good as a single-band beam. As always with antennae designs, the objective appeared to be quite impossible. A correctly designed single-band beam can be expected to operate satisfactorily throughout the whole of any one band with a possible exception of 10 metres. The match will normally fall off at the edges of the band, but even this can be compensated for on a single-band beam by suitable reactance compensation.

Briefly, reactance merely means the effect of mis-tuning, and normally if, for example, a dipole is operating h.f. of resonance it will have an inductive reactance, namely it will look like an inductance. Similarly, if the dipole is l.f. of resonance, it will have a capacitive reactance. Now all that is necesesary to bring the dipole back on tune is to apply the opposite amount of reactance and, if this reactance can be made to vary with frequency inversely to that of the dipole, then it is possible to provide compensation and the antenna remains on tune over a much larger bandwidth than normal.

These principles of reactance compensation may be applied quite simply to single-band beams by the use of stubs, etc., but the possibilities of reactance compensation on a multi-band beam seem almost impossible and, in fact, most designs of multi-band beams have a considerably narrower bandwidth on any one band than an equivalent single-band beam.

TRAP DESIGN

Trap design is the fundamental in all multi-band beams and trap performance may be divided into two parts. Firstly, the characteristics at resonance where a high degree of isolation is required, and, secondly, but possibly a more important characteristic and one which is so often ignored, namely, that of trap performance on the bands other than the resonant frequency.

With the thought in mind that it might prove possible to provide a measure of reactance compensation by means of the off-resonance characteristics of traps, various trap configurations were considered. The normal type of trap using a resonant coil and capacitor has reasonable characteristics at resonance, although the bandwidth tends to be inadequate. The performance on other than the resonant band, however, left very much to be desired and, far from providing reactance compensation, this type of trap was making the situation worse, resulting in very limited bandwidth characteristics of the antenna as a whole. Consideration was then given to the use of a quarter-wave stub, but although the resonance characteristics appeared to be improved and a better bandwidth could be expected, the off-resonance characteristic was still the opposite to that required for successful reactance compensation.

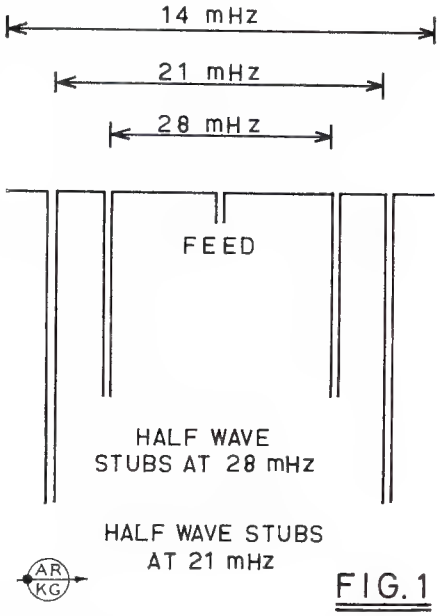


FIG. 1

The project of a no-compromise beam nearly foundered at this point and designs were actually in hand for a standard type of three-band beam using well known principles of trap design. Little enthusiasm existed for this antenna as not only did it not meet the specification, but it offered no more than existing commercial designs.

USE OF HALF-WAVE STUB

The usual British winter weather took a hand here and kept the laboratory antenna testing staff indoors with little to do but think, and suddenly the thought arose: why not try a half-wave open stub as a trap? Consideration of the theoretical aspects of this idea showed considerable promise, not only that bandwidth would be adequate at resonance but reactance swing appeared to be in the correct direction at last to provide compensation against the reactance swings of the antenna alone.

Theory indicated therefore that reactance compensation was possible, but to achieve an exact balance in practice was quite another thing. Calculation of the reactance characteristics of the half-wave stub was no problem whatever, but calculation of the feed characteristics of even a three-element yagi borders on the use of computer techniques and some practical work seemed to offer a far quicker solution.

Tests on full size antennae at 14 Mc. are expensive and time-consuming and the results, bearing in mind the proximity of the ground and nearby objects, are unlikely to be reliable and repeatable. Tests were therefore carried out at 10 times the operating frequency, namely at 140, 210 and 280 Mc. On these frequencies, using a sweep generator, it proved possible to display on a cathode-ray tube screen the complete matching characteristics of the antenna on all three bands simultaneously and thus, not only would it be possible to see the effect of adjustments of the traps at their resonant frequency, but also the effect on the other two bands.

It proved possible to produce a highly efficient three-element yagi operating on 140, 210 and 280 Mc. and measurement of the bandwidth in practice showed that reactance compensation had indeed been achieved on the two lower frequency bands, but not at the highest frequency. The reason for this is of course that, at the highest frequency, namely 280 Mc., the 280 Mc. trap is behaving correctly as an open circuit and to all intents and purposes, the rest of the antenna does not exist. On 140 Mc., however, both the 210 and 280 Mc. traps are in series with the antenna elements although they are not resonant at 140 Mc. The off-frequency trap compensating properties therefore operate and the match obtainable on the final antenna at 14 Mc. was almost too good to be true: in fact better than 1.1/1 from 14.0 to 14.4 Mc. At 21 Mc., there is still compensation from the 28 Mc. trap which is in circuit but of course off-frequency, and although the match is not as phenomenally good as on 14 Mc., there is still coverage of the entire band at better than 1.5/1. On 28 Mc., there is no reactance compensation since, as previously stated, the traps have shut off the rest of the antenna, but nevertheless it has proved possible to obtain a match better than 1.6/1 from 28.1 to 28.7 Mc. Fig. 1 shows the schematic of how the three-band dipole finally looked using the half-wave traps.

MECHANICAL DESIGN

The next problem was one of mechanics on how to accommodate this type of trap to a practical waterproof design. The necessary properties are strength, lightness, resistance to weather and good electrical power factor. No one material is capable of providing all these properties and it proved necessary to use fibre-glass for strength and lightness together with polythene for insulation and good power factor.

The half-wave stub was composed initially of 72 ohm flat-twin trans-

* J Beam Engineering Limited, Northhampton, England.

mission line and attempts to place this loosely inside the radiator tube were doomed to failure due to uncontrollable capacitive effects. It was, however, found that the half-wave stub could be wound into the form of a coil without adversely affecting the electrical properties. Unlike a coil, however, there was no large external field, in fact the winding could be on metal with little effect, or it could be inside a metal tube without the adverse effects which occur when a normal coil is placed inside a close-fitting screening can.

The fact that the stub could be placed inside a tube led to the obvious conclusion that the best place for it was inside the antenna elements and the final configuration is illustrated in Fig. 2, where there is complete protection against the weather for the stub and the strength of the join is provided by the fibre-glass joint piece.

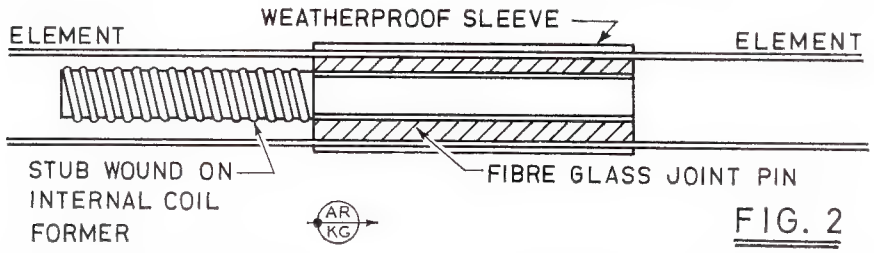


FIG. 2

The mechanical considerations of the final design now had to be considered. A half-wave element on 20 metres is quite simply and logically 10 metres long and the no-compromise design of the traps meant the dipole would in fact be half a wave long, namely 33 feet. This length of element has to be supported in the centre and, assuming it to be made from 1" diameter tubing, the total area is just under 3 square feet. The wind pressure at 100 m.p.h., allowing for the circularity of the elements, is 25 lbs. per square foot, and thus a 1" element at 20 metres will have to be designed to withstand 75 lbs. of wind pressure.

The total wind pressure on a three-element array including the cross-boom will be approaching 300 lbs. The obvious method of reducing these stresses is to taper the element, thus reducing wind pressure on the tips where leverage is greatest. Cost considerations dictate that the taper must be in the form of steps and it is convenient on a three-band beam to step the element size down at the point of insertion of a trap. Total wind pressure by this means is reduced to approximately 200 lbs. at 100 m.p.h., but even so, to provide an adequate margin of fatigue resistance, a 2" boom is essential.

SPACING AND FEEDING

On 20 metres, a spacing of one-eighth wavelength results in a reasonable sized antenna, but due to the close spacing, the Q is high and the provision of adequate bandwidth and match is very difficult. With reactance compensation, however, the high Q of the close-spaced beam proved to be an advantage as is shown by the almost perfect match obtainable throughout the 14 Mc. band. It was therefore decided to standardise on a spacing of one-eighth wavelength at 20 metres, giving a boom length of some 16 feet and a spacing on 15 metres of 0.185 wavelength, and on 10 metres of 0.25 wavelengths.

The increase on spacing on the two higher bands is particularly advantageous in this design since, on 20 metres where spacing is closest, there are two traps in use to provide reactance compensation, and on 15 metres, where the effective spacing is larger requiring less compensation, there is only one trap in use, and on 10 metres, where no reactance compensation is possible, the spacing is effectively quarter-wave and a three-element quarter-wave spaced beam has a dipole feed impedance of virtually 50 ohms with no problems.

The question of a balun was then considered, and although it proves very difficult in practice to measure the difference between antenna with a balun and one without, the no-compromise thoughts definitely dictated the use of a balun, if only to reduce t.v.i. problems due to radiation from the feeder. The only possible type of balun which would not upset the careful impedance balance which had been achieved was a non-resonant device and design was finalised on the modern ferrite-ring balun which could easily be incorporated in a waterproof connector box.

A word of warning is perhaps appropriate here in that one particular type of ferrite strongly recommended in magazines proved to have utterly unacceptable losses which appeared in the form of heat and a rising mis-match when power was applied to the antenna. Investigations had to be undertaken into the properties of ferrites and the correct type for this particular application was finally found and both the traps and the balun will withstand continuously 1 kw. of c.w.

GAIN ACHIEVED

Tests of short distance free-space gain showed that the theoretical maximum of 5.8 db. over a single dipole was achieved and it is interesting to wonder how some quoted gain figures for three-element beams of 8 and 10 db. can possibly be justifed. The answer of course is in the DX gain of an antenna system which depends mainly upon angle of radiation, thus considerable advantages must accrue from the use of the beam which cannot waste power upwards, as with a long wire or dipole.

It is difficult, however, to justify any numerical statement of this DX gain, but there can be no doubt that it exists —in fact tests were carried out using a dipole as a standard of comparison. Locally, tests of gain between the beam and the dipole showed the theoretical beam gain of 5.8 db., but a daily sked with VK2NN, using instantaneous switching between the beam and the dipole, showed a consistent 3 S points improvement with the beam and this was repeated on similar skeds with WA8BBN. Three S points is 12 to 18 db., which is quite impossible to achieve from a three-element beam, but this amount of DX gain quite definitely does exist.

Since this initial design was a three element to cover three bands, it was decided to name it the Triple Three, with the possibility of a family of Triples reaching to Triple Fours and Triple Sixes in the future. Doubts exist on whether it will be possible to achieve the same amount of reactance compensation with a 4 and 6 element beam and in any case, lots of headaches are in store from the mechanical standpoint in that a six element must have a wider spacing than one-eighth wavelength with consequent problems in boom design which will undoubtedly need to be larger than the present 2", bringing in all the attendant problems in the design of new fittings.

Sincere thanks are due to VK2NN, WA8BBN and G3OUJ for their patience in providing the other end of the final test range, where business became pleasure.

— . . . —

PROVISIONAL SUNSPOT NUMBERS

MAY 1969

Dependent on observation at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	90	16	121
2	77	17	124
3	70	18	117
4	73	19	120
5	88	20	123
6	71	21	163
7	57	22	178
8	87	23	198
9	81	24	205
10	100	25	182
11	125	26	177
12	149	27	145
13	155	28	136
14	169	29	88
15	146	30	54
		31	50

Mean equals 120.0.

Smoothed Mean for November 1968: 110.0.

—Swiss Federal Observatory, Zurich.

TRANSISTORS

DIODES, FETS, RESISTORS, CAPACITORS, etc., etc.

The W.I.A., Victorian Division, has available a wide range of new components. Members of any Division wishing to take advantage of this service may obtain a components' list by sending a s.a.s.e. to:

DISPOSALS COMMITTEE,
P.O. BOX 65,
MT. WAVERLEY,
VIC., 3149.

Modifications to the No. 10 Crystal Calibrator to use 3 Volt Filament Supply

P. DAW, VK2AGJ*

The diagrams show the power supply I used and the modifications made to the No. 10 Crystal Calibrator to operate it from 3 volts d.c. filament supply.

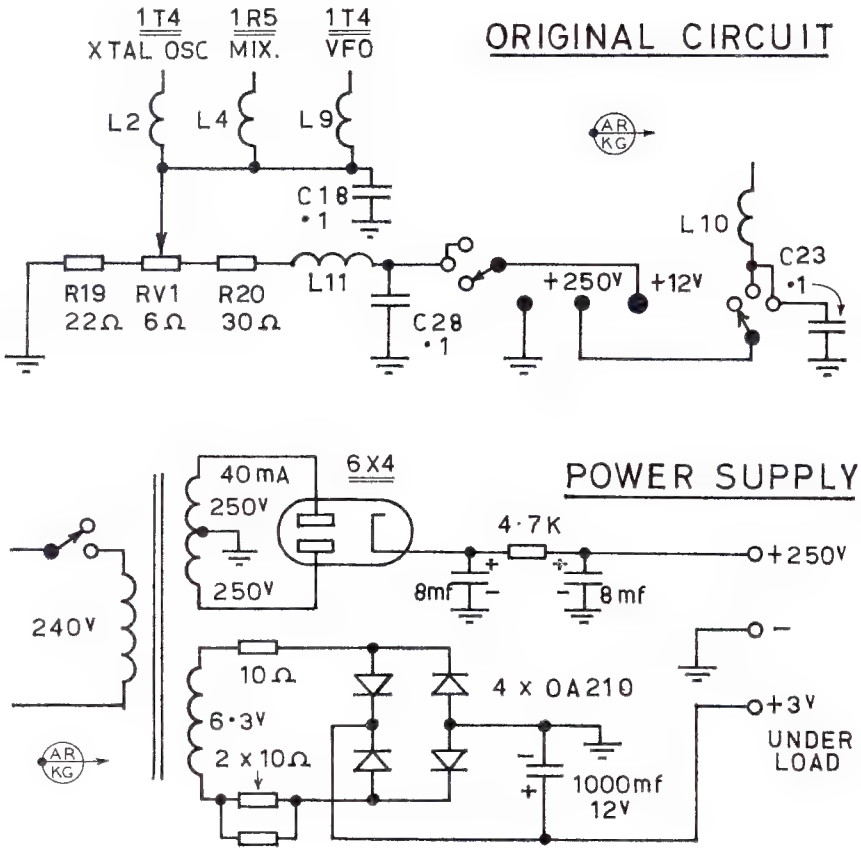
The most difficult part of the job is disconnecting R19 from the earth lug. I used needle nosed pliers and carefully bent the wire back and forth where it was soldered to the lug until it broke. Then I lengthened the resistor pigtail by soldering a wire to it with a small iron and insulated the lead with spaghetti tubing. I removed the screw holding the solder lug and mounted a piece of bakelite under it which extended to the large hole alongside.

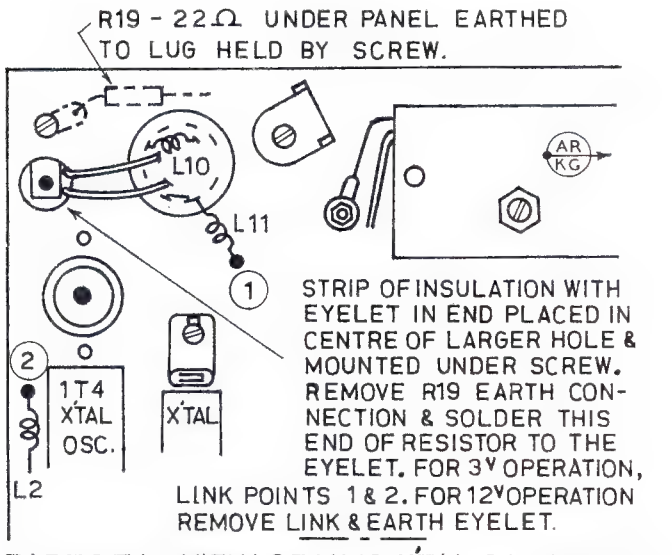
An eyelet was placed in the bakelite and centered in the hole so that it would not short to the chassis and the pigtail of R19 soldered to this. An insulated link connected to points 1 and 2 (L11 and L2) completed the modification.

Three volts positive is applied to the large pin on the front panel instead of 12 volts.

The power supply showed slight hum when using the calibrator, but was not excessive. A larger capacitor in the l.t. filter would probably improve matters.

* "Woodlands," Wombat, N.S.W., 2595.




R19 - 22Ω UNDER PANEL EARTHED TO LUG HELD BY SCREW.
L10
L11
AR KG
1
2
1T4 XTAL OSC.
X'TAL
L2
STRIP OF INSULATION WITH EYELET IN END PLACED IN CENTRE OF LARGER HOLE & MOUNTED UNDER SCREW. REMOVE R19 EARTH CONNECTION & SOLDER THIS END OF RESISTOR TO THE EYELET. FOR 3V OPERATION, LINK POINTS 1 & 2. FOR 12V OPERATION REMOVE LINK & EARTH EYELET.

PART REAR VIEW OF N°10 X'TAL CALIBRATOR
MODIFICATIONS TO USE 3V FILAMENT SUPPLY

AVAILABLE NEXT MONTH!

1969-70

AUSTRALIAN RADIO AMATEUR

CALL BOOK

Order your copy now from your Division or usual Supplier

I.A.R.U. REGION III. NEWS

The W.I.A. Director, John B. Battrick, VK3OR, has written to all Region III. Amateur Societies inviting them to join the Association. A complete outline of suggested activities with a copy of the interim constitution, provides a complete picture to the Region III. Association.

I.T.U. CONFERENCE

The agenda for this conference was listed in the August issue of "A.R." and the I.A.R.U. Hdqrs. have stressed that it is important for I.A.R.U. Societies to contact their telecommunication officials to allow a mutual exchange of information.

The Region I. I.A.R.U. conference, as reported below, wish to achieve a mutual aim of expansion of Amateur space privileges generally for frequencies above 28 Mc. The reason for wanting this clarification is that I.T.U. regulations state that Amateur space activities shall be permitted between 144 and 146 Mc. This has been interpreted by some administrations as prohibiting activity on other frequencies.

I.A.R.U. and Region I. feel that Amateur space communication (satellites **and** moonbounce) should be permitted in all bands above 28 Mc. It should be the aim of all Societies to take up their question with their administrations, whether the result is a series of permissive footnotes to each Amateur band involved, or a change in the definition of the Amateur Service as contemplated by U.S.A.

At the proper time Headquarters will apply to I.T.U. for admission of the International Amateur Radio Union to the Conference in observer status. Observers from U.K., France, U.S.S.R. and U.S.A. are likely to be present as members of their respective delegations.

REGION I. CONFERENCE

During the week of May 4-10, Region I. Societies met in Brussels and discussed matters of reciprocal licensing, Amateur Radio in developing countries, intruder watch and representation at the forthcoming space conference.

1970 will be the first year of a new system whereby one of the European contests (e.g. W.A.E.) will be the nucleus of a larger DX contest sponsored in the name of Region I. The **Radio Sports Federation** of the U.S.S.R. offered to provide the major trophy.

A world-wide set-up of 10 and 15 metre beacons was endorsed by the Conference. G2BVN is co-ordinator.

Promotions programmes will be undertaken to create a widespread interest of Amateur Radio among citizens of developing countries.

NEW MEMBER FOR REGION III.

The Western Samoa Amateur Radio Club has been approved by Member Societies of the I.A.R.U. The Secretary is Ron F. Seager, P.O. Box 498, Apia, Western Samoa.

Call Signs in the Territories

Federal Secretary,
Wireless Institute of Australia,
Box 2611W, G.P.O.,
Melbourne, Vic., 3001.

Dear Sir,

As you know, amateur radio stations licensed for operation in the Territory of Papua-New Guinea and other external territories other than Antarctica have hitherto been assigned call signs prefixed by the letters "VK" followed by the numeral "9" and two or three other letters of the alphabet.

As a result of a review which was made recently of the call sign position in the areas concerned, it has been decided to re-arrange the "VK9" series to provide distinctive call sign groups for each of the territories in question.

Accordingly, as from 1st July, 1969, full privilege amateur stations authorised for operation in the territories concerned will be allocated call signs from within the particular group set aside for the area in question as indicated hereunder:

(a) Papua-New Guinea—
VK9AA — VK9MZ

(b) Norfolk Island—
VK9NA — VK9NZ

(c) Christmas Island—
VK9XA — VK9XZ

(d) Cocos Island—
VK9YA — VK9YZ

(e) Other territories under Australian jurisdiction—
VK9ZA — VK9ZZ

Call signs for limited amateur stations will be allocated on the same basis except, of course, that the suffix letters will be preceded by the letter "Z".

Notwithstanding the abovementioned alterations in call sign arrangements, however, in view of the significance which many amateur station licensees attach to call signs, particularly in cases where they have been employed for a long period, no licensee will be required, at this stage, to forego an existing call sign which does not conform with the new allocation plan unless he makes a specific request for such a change.

It would be appreciated if you would be good enough to arrange for information concerning the abovementioned matters to be included in your monthly journal, please.

Yours faithfully,
C. Carroll,
for Director-General.

— . . . —

JAMBOREE-ON-THE-AIR

Most Amateurs are aware that this event is to take place world-wide over the week-end of 18th and 19th October.

Have you thought of setting up a link station in a Scout Hall? VK3ASC expects to operate, over the whole 48 hours if more volunteers come forward, from a Scout Hall in the Heidelberg district. Any Amateur from the Heidelberg district who can offer assistance will be welcome and should contact Syd VK3ASC on 45-3002 (after 6 p.m. most evenings) or 69-0300 ext. 200.

"Said the Spider in the Sky"

(Continued from Page 9)

orient the steerable antenna within ±12.5 degrees (capture angle) of the line-of-sight signal received from the earth. Once the antenna is positioned within the capture angle, it can operate in the automatic mode within the limits of its gimbal mount.

In flight, two omni-directional S-band antennas can be used; one forward, one aft on the LM. The radiators are right-hand polarised helicals that collectively cover 90 per cent. of the sphere at —3 db. or better. As mentioned earlier, there is also an erectable 10-foot parabolic surface reflector that is unstowed from a side compartment of the descent stage after landing.

The two v.h.f. inflight antennas are also omni-directional right-hand circularly polarised radiators. An 8-inch conical monopole with 12-inch radials is used between the LM and the spacemen equipped with the PLSS. The monopole is mounted on the top of the LM and is erected by an astronaut after landing the LM.

Summing up the communications system aboard the Lunar Module, it might be said that flexibility is the by-word, for in nearly every respect, redundancy of function has been "engineered-in".

Without waxing too poetic, it might be said that despite the superficial ugliness of America's "Spider in the Sky", its real beauty "lies in the harmony of man and his industry" that it represents.

DURALUMIN
ALUMINIUM
ALLOY TUBING

IDEAL FOR BEAM AERIALS AND T.V.

★ LIGHT ★ STRONG
★ NON-CORROSIVE

Stocks now available for Immediate Delivery

ALL DIAMETERS — ¼" TO 3"

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ALL SIZES AND GAUGES

GUNNERSEN ALLEN METALS
PTY. LTD.

SALMON STREET,
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Phone 64-3351 (10 lines)
T'grams: "Metals" Melb.

HANSON ROAD,
WINGFIELD, S.A.
Phone 45-6021 (4 lines)
T'grams: "Metals" Adel.

AMATEURS LOCATE MISSING AIRCRAFT

On Thursday, 17th July, 1969, a light aircraft with five people on board was reported overdue. It had last reported its position as being near Ararat at about 2100 hours. The following morning a search aicraft spotted what appeared to be wreckage approximately three-quarters of a mile south west of the television transmitting tower at Lookout Hill in the Mount Cole Range. The staff at the National television station were informed that it was possible the plane had crashed not far from the transmitting site.

Three local Amateurs figured prominently in the ensuing search, these were: The Officer in Charge of the National Station, Harvey Lelliott, VK3ZG; staff members, David Giles, VK3ADS, and Neville Maddern, VK3AAQ.

After a discussion at the station, the O.I.C. decided that, as it was unlikely that there would be any search parties operating in the area for some time, a search could be instituted using station staff. Using VK3ADS' car equipped with 2 metre f.m. equipment, VK3ZG and VK3ADS set off for the probable crash site.

Before leaving, they had carefully studied a map of the area and worked out, with astonishing accuracy, the probable position of the wreckage. VK3AAQ, in Ararat, was contacted by phone and requested to make radio contact with VK3ADS. Within five minutes of receiving this request, contact was made between the two mobiles and once it was ascertained that the contact could be maintained in the search area, the Ararat Police were advised that VK3AAQ was in radio contact with a search party. At this stage, the Police had cars moving towards the area but advised that the spotter plane was not certain that what he had seen, was, in fact, the missing plane.

Approximately half an hour after the initial contact, VK3ADS reported that they had located the wreckage and that two bodies had been found. VK3ZG remained with the wreckage and continued the search for the missing people while VK3ADS drove back to the main mountain road to direct Police and rescuers to the scene as well as marking the route to be followed for any late arrivals. VK3AAQ, meanwhile, notified the Police by phone the details thus far, which they were then able to pass on to their cars which had still not arrived at the area. Contact was maintained between the two Amateur Stations until the Police arrived and established that they could maintain radio contact with the Ararat Police Station from the scene of the accident. The Amateurs' job was then completed and both stations closed down.

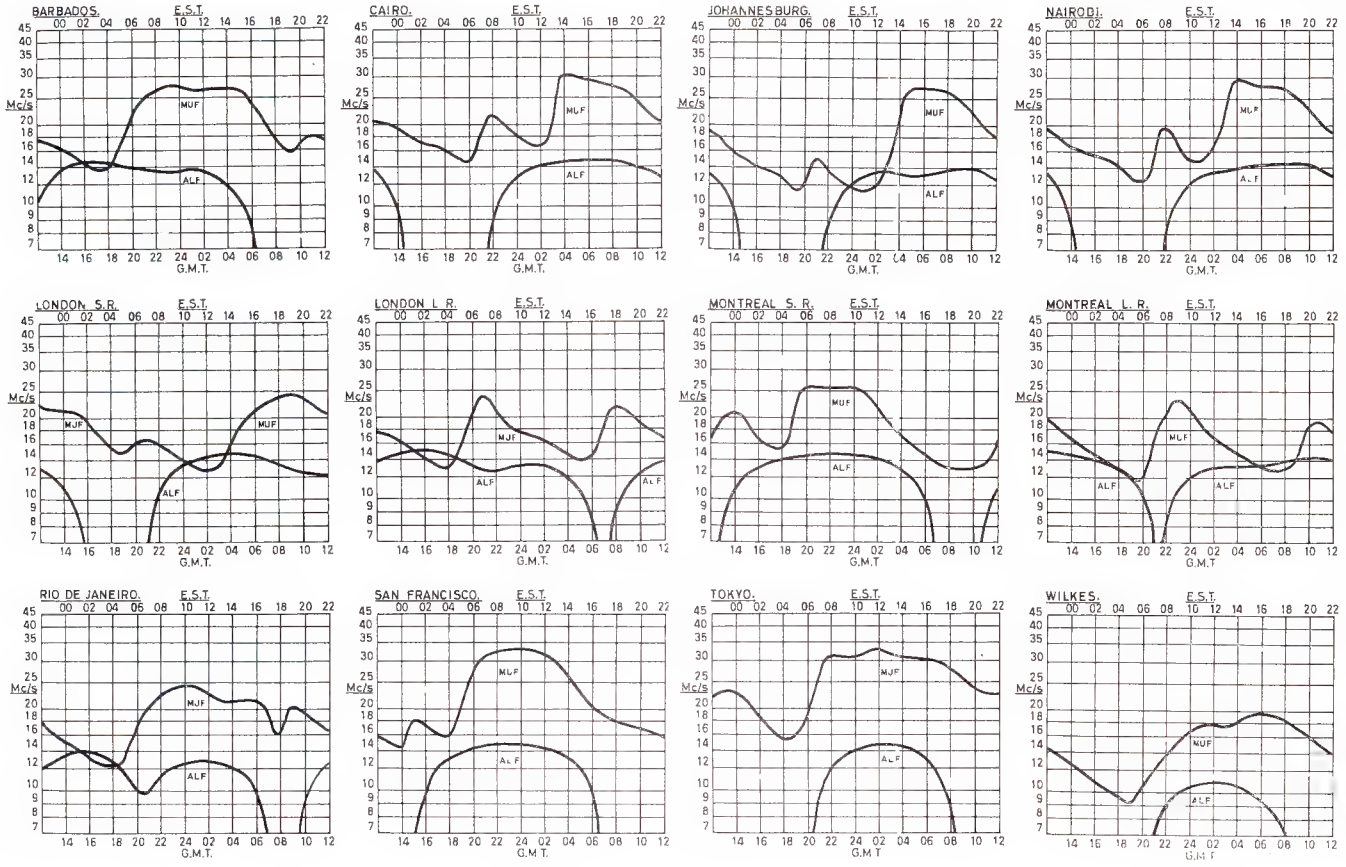
At this stage it should be pointed out that, although the traffic was carried by two Amateur stations, there were two other stations standing by ready to play their part if required. These two were Stan VK3SE at Ballarat and Ted VK3ZQA in Ararat.

The operation went off very smoothly and should be worthy of recording that once again Amateurs were ready and able to provide communication when the need arises.

Perhaps it should also be mentioned that the Amateurs' participation was entirely on their own initiative, they were not requested to render help by any authority. Just how much time they saved the authorities is difficult to gauge, but as there was no communication between spotter plane and ground parties, it is quite possible that several hours could have been saved. Had anyone survived the crash, this time could have meant the difference between life and death. By the time Police and rescuers arrived at the scene, VK3ZG had located two more bodies and VK3ADS then located the fifth and final victim. The part played by VK3ADS and VK3ZG must surely be worthy of recognition, but anyone who followed the press and radio coverage, would not have known the part these two, and Amateur Radio, played in the drama.

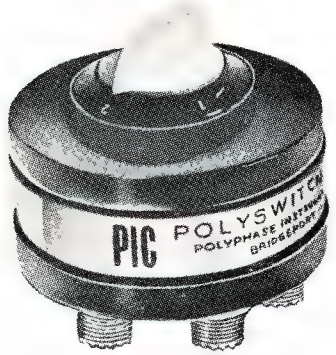
PREDICTION CHARTS FOR SEPTEMBER 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



New Equipment

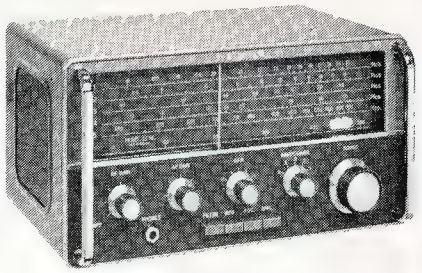
PIC RF SWITCH



Switching of r.f. power can now be done quickly and safely, with minimum losses, by using the latest system of r.f. power transfer, the Pic Polyswitch, now available from Bail Electronic Services. Designed for higher load-carrying, they are capable of handling 1 kw. a.m. or 2 kw. p.e.p. Of ceramic construction with silver plated contacts, these switches are sealed against dust and are easily mounted; will take standard PL259 co-ax. connectors. Two models are available, the PS750, single pole, 5-position switch, and the PS752, single pole, 2-positions.

Further information may be obtained from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

EDDYSTONE EC10 RECEIVER



R. H. Cunningham Pty. Ltd. have released the latest product from Eddystone, the EC10, transistorised communications receiver. Designed for commercial and Amateur use, the EC10 is fully transistorised, of compact dimensions and is light in weight. Five frequency ranges provide continuous coverage from 550 Kc. to 30 Mc., including the broadcast band, marine band from 1500 Kc. to 3000 Kc., and six Amateur bands from 160 metres to 10 metres.

Features include built-in speaker, b.f.o. and a flywheel-loaded tuning knob controls a gear drive with a reduction ratio of 110 to 1. Power is derived from six U2 type batteries housed in a separate detachable compartment. An alternative a.c. power supply is available if required. Housed in a metal cabinet, the EC10 is of robust construction and finished in an attractive two-tone grey. A fully illustrated technical brochure is available on request. List price, $179.40 plus sales tax where applicable. A.c. power supply extra.

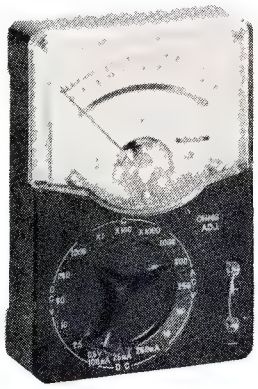
Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

A & R CATALOGUE

The new 1969-70 A & R-Soanar Group catalogue of power supplies, transformers and chokes is now available. Comprising 26 pages of technical data and specifications, the catalogue features a wide range of transformers and chokes, with a detailed stock price list.

A section is devoted to power supplies which include precision and regulated types to meet applications for laboratory, commercial and Amateur use. The catalogue is available free and enquiries should be directed to A & R Electronic Equipment Pty. Ltd., 42 Lexton Road, Box Hill, Vic., 3128.

RAPAR MULTIMETERS



Available from Radio Parts Pty. Ltd. is a new range of multimeters to suit many applications for commercial and Amateur use. Branded Rapar, there are six models priced from $9.00 for the YT68A model, to $45.00 for the SK100, a full size meter fitted with a carrying handle. Specifications and other details are featured in Radio Part's advertisement elsewhere in this issue.

☆

CORNISH AWARD

This award is issued by the Cornish Radio Amateur Club for working stations in Cornwall, England in three classes.

European: Class I. 30 points; Class II., 20 points; Class III., 10 points.

Non-European: Class I., 15 points; Class II., 10 points; Class III., 5 points.

Each different Cornish station counts one point but same station worked on a different band also counts.

QSL cards need not be sent but log data must be confirmed by two licensed Radio Amateurs or by an officer of a National Radio Society.

C.H.C. all directory rules apply AOMB/M free disabled and B/P. Available to S.w.l's. Apply with G.C.R. and 5/-, $1 or eight IRCs to: Awards Manager, Ted Bowden, G2AYQ, "Albany House," Goonown, St. Agnes, Cornwall, England.

ADDITIONS TO BOARD OF DIRECTORS

Hy-Q Electronics, of Frankston, Vic., an independent quartz crystal manufacturer, has announced the following additions to their Board of Directors.

Mr. D. H. Rankin, M.I.E. (Aust.), A.M.I.R.E.E. (Aust.), has been appointed Technical Director.

Mr. Rankin, a fully qualified Chartered Engineer, has had a long association with a prominent crystal manufacturer as Chief Crystal Engineer.

He has travelled extensively and has attended many important Crystal/Frequency Symposiums in the U.S.

Mr. R. W. Taphouse has been appointed Manufacturing Director.

Mr. Taphouse was formerly Manager of the Crystal Division of a prominent manufacturer and has many years of experience overseas in the crystal manufacturing industry in a senior production capacity.

— . . . —

CHASSIS HOLE PUNCH

A sheet metal punch that will cut holes in steel and aluminium up to 16 gauge is now available in a range of sizes for hole diameters from 3/8" to 1-1/4". Branded Q-Max, these metal punches cut cleanly and leave no jagged edges and will be found ideal for the hobbyist and Radio Amateur not equipped with a machine shop. Punches to cut square (11/16" and 1") and rectangular (21/32" and 15/16") are available also ex stock.

Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

— . . . —

W.A.V.K.C.A. AWARD

The following Amateurs have received this Award during the period 1/7/68 to 30/6/69:

Cert. No.	Call	Cert. No.	Call
337	ZL2NV	354	UB5KDS
338	JA7MA	355	ZL3RK
339	KR6TAB	356	JA2CZS
340	ZL3JU	357	JA2LA
341	UA0RV	358	JA1NDO
342	JA1FI	359	ZL1AMN
343	SM0ATN	360	GW4NZ
344	ZL1ON	361	WB6IUH
345	G4JZ	362	JA1OCA
346	OK1MP	363	JA1MIN
347	ZL2QK	364	VP7NH
348	JA2JKV	365	W4UAF/KH6
349	KR6KQ	366	UA3UJ
350	VP7NA	367	UB5MZ
351	JA1AKH	368	GM3CFS
352	VE5FO	369	K4AUL
353	DL1MD	370	JA6BEE

— . . . —

VK S.W.L. D.X.C.C. AWARD

1.	WIA-L3042	Eric Trebilcock	1965
2.	WIA-L2022	Don Grantley	1965
3.	WIA-L3211	Warwick Smith	1966
4.	WIA-L4018	Chas. Thorpe	1966
5.	WIA-L5080	Ernie Luff	1967
6.	WIA-L3229	Bob Halligan	1967
7.	WIA-L6021	Peter Drew	1968
8.	WIA-L2283	Bob MacIntosh	1969
9.	WIA-L5088	Steve Reudiger	1969
10.	WIA-L3185	Brian Hannan	1969

(All enquiries to Eric Trebilcock (WIA-L3042), S.w.l. Awards Manager for VK, 340 Gillies Street, Thornbury, Vic., 3071.)

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"BREAK-IN"

June 1969

The 663 H.F. Beam, ZL2ASJ. This beam operates as a six-element on 10 and 15, and as three-element on 20. It is a full-sized beam and the longest element is about 34 feet long. The boom is made from two sixteen foot lengths of 2 x 1½ inch oregon. Tuning for operation on the two higher frequency bands is accomplished by LC circuits inserted at the element centres and the switching is done by relays.

Simple Beam Rotator, ZL1AYT. A "hand-raulic" system rotated by leaning out the window to swing the beam around. The beam in this case being a 2 metre six over six skeleton slot type.

V.H.F. Antennas, ZL1TFE. Describes the usual types of v.h.f. beams and methods of matching.

All All-Band Transmatch, ZL1FS. The author means all h.f. bands.

The 21 db. Two Metre Sly Beam, ZL4TAH. This is a different type of long yagi and the name comes from "Suspended Long Yagi" because the beam is made up ladder fashion from aluminium tubing and artificial fibre cordage. It folds into a neat bundle for transport.

Home-Brew Heliwhip, ZL3QR. The interesting thing about this eight ft. helical whip is that it has a matching section at the bottom consisting of several 7-inch sections with the pitch of the winding diminishing from 2 to 1/8 inch before going into the close-wound section. The author claims this technique increases the impedance from about 20 to around 50 ohms.

Coupling the Co-ax. to the Antenna. Some interesting ideas for coupling the co-ax. and a dipole at the centre.

Tips on Tuning a Beam, W6BLZ.

The issue is completed by all of the usual features.

"CQ"

May 1969—

The front cover describes this as a "**Special Surplus Issue**". Do not give it away at this stage for what they mean is that it is especially devoted to the modification of Disposals equipment.

The ARC-5 Receiver Transmitter. W2DYR describes a phasing type s.s.b. rig for use on 7 Mc. He suggests others can be used for operation on 1.8 or 3.5 Mc.

A Q5er for the BC454. W3EAG describes how to use a BC453 as a second i.f. at 85 Kc. to give the faithful 3-6 Mc. BC454, with its 1415 Kc. i.f., greater selectivity.

Converting the No. 19 Sets, by W6JTT. This is an article I never expected to see in an American magazine. Apparently some British disposals has percolated onto the American market and in some quarters is highly prized.

Surplus British Electronics. W6JTT gives a good run-down on what is available from British sources and suggests how the best use can be made of it.

Putting the Raytheon 21TR11A F.M. Transmitter/Receiver on Two Metres, WA2DND. Lots of miniature tubes and an 832A.

Putting the URC-11 on 220 Mc., W3TFA. A small hand-held walkie-talkie type equipment for operation on our shortest v.h.f. wavelength.

Putting the Motorola R394/U F.M. Receiver on Two Metres. W6JTT must have a whole station made up from "surplus".

Re-inking R.T.T.Y. Ribbons, W2IDX. To think I always thought they used standard typewriter ribbons. That shows how much I know about r.t.t.y.!

Two Metre F.M. with the ARC-5, W2IAZ. The unit described here was never seen in quantity on the Australian market.

A Power Supply for the URC-4 and URC-11. Modern solid state circuitry to replace those accumulators.

The Galaxy GT-550 Transceiver, W2AEF. Wilf reviews a piece of equipment which is not yet surplus.

June 1969

A Two-Channel Converter for Apollo Reception, W6AJF. Perhaps there are a number of VK Amateurs who wish this had appeared a month before Apollo 11. Come on fellows, don't despair, there is still time to build one for No. 12.

The Pop Bottle Vertical, WA0EMS. The Amateur is noted for his skill in improvisation and WA0EMS makes a "Coca Cola" bottle into a re-useable.

Simultaneous Transmitter and Receiver Operation, W2EEY/1. A subject which should be dear to the hearts of all N.F.D. "multiple operator" teams. Or, so that's how to work three bands simultaneously.

A Current Sensitive Pilot Lamp, W1USM. A very sure way of indicating current flow. The transformer need not be so large of course!

An Improved 7360 Converter for 14 and 21 Mc. VU2JN. It uses two innovations in addition to the 7360. Ferrite toroidal coils and a front end "Q" multiplier.

Build Your Own Tilt Over Tower, WA7EMM. The author is a professional engineer and the article probably contains sufficient information to satisfy the local council. One of the best articles I have seen in recent times.

What's a Fortune Cookie, GM3BST. The story of his visit to the U.S.A. with the General Electric Company playing fairy godmother to John and Margaret Tuke reads as though he has been brain washed. Will someone please offer to brainwash me and my XYL in smilar fashion?

The Inverted Vee Contest Antenna, W3FQJ. Describes three "droopy dipoles" using one pole, one feed line and co-axial feed for operation on bands from 6 to 80 metres.

Said the Spider in the Sky, K4DSN. This is it men, it gives details of the communications systems used on trips such as that just completed by Apollo 11. It helped me answer questions from fellow workers and the kids at home.

"CQ" Review: The Heathkit SB-200 Linear Amplifier, W2AEF. Since these units are being sold in Australia this will probably interest quite a few.

"QST"

June 1969

The QRP 80-40 C.W. Transmitter. W1CER describes a small solid state rig for these two popular bands. Uses only three transistors, a zener diode and is crystal controlled. Another interesting point is that all the inductors are on toroids.

Aluminium Tubing—What Sizes are Available. W1CP lists the sizes of round (circular) aluminium tubing available on the American market in grade 6061-T6 (61S-T6) which is considered to be the best all round grade for use by Radio Amateurs and others for building antennas.

Cathode Ray Tube Display Unit for Satellite Weather Pictures, W7UGV. The picture reproducing system described here permits use of an ordinary camera for recording the slow-scan t.v. weather pictures transmitted by the Nimbus and Essa satellites. Relatively simple circuits are used, with horizontal synchronising controlled by pulses included in the picture transmission.

The Mainline TT/L-2 F.S.K. Demodulator. W8SDZ continues the article commenced in May issue of "QST". This demodulator will handle both 850 and 170 c/s. shifts.

1275/2125 C/s. Filters for the TT/L-2 F.S.K. Demodulator, K1PLP. In some of the pictures they look like the buns or "chignons" that the ladies prize so highly. He must have had a great deal of fun with his toroids.

Clean Up Your Harmonics, W1CP. Lew tells American readers how to stay out of trouble with the F.C.C. Since the American regulations are based on International agreement of standards, just as ours are, I suppose this will apply in Australia.

Three Innovations for Field Day, K6YNB. Take one lawn mower motor, one motor car alternator and a spare battery and your field day insurance is complete. Will supply in excess of 500 watts is the claim. No. 2 is a plywood construction to fit into the front seat of the car so that the equipment can be placed thereon and the log, etc., will be tilted at a convenient angle. No. 3 is a tilt-over tower for, in the writer's case, a two-element quad. Three very interesting articles although it appears to me that the generating system is unnecessarily clumsy with its vee belt drive. The tower idea also looks very practical and will appeal to anyone handy with tools. My personal problem is centred around three lengths of 2-inch conduit and whether or not I can get a flange to fit?

Recent Equipment—Galaxy GT550 Transceiver. An updated version of the Galaxy V. which was so popular amongst Australian Amateurs a few years ago. This new model gets away from the necessity to squint to read the dial and uses a pair of 6LB6 tubes in the final running 550 watts d.c. input on sideband peaks. The c.w. rating is lower at 360 watts. It would appear that the sections of this transceiver which are really new are the ones which are solid state because the receiver a.f. stages and the "pre-mixer" chains have gone solid state.

Easily Constructed Antennas for 1296 Mc., WA2VTR.

* * *

In this issue is an article "Three Innovations for Field Day" and on page 53 a letter from W4JRU on the use of motor car alternators for field day use. At the risk of buying an argument with some better technically qualified person, I am going to suggest a somewhat different approach.

The average car alternator is a three-phase, high frequency device. W4JRU suggests about 180 c/s. at 2000 r.p.m. (The actual frequency can be worked out easily by counting the number of pairs of poles and multiplying by revolutions per second.) The battery is necessary to provide field excitation and it is probably indispensible. Were I to use one of these alternators for the supply of a.c. power to a transceiver taking about 500 watts, I would need to split the load into three so that each phase would be loaded about equally. The average transceiver power supply does not lend itself to an easy splitting of the load on a constant basis, but I feel sure that no harm will come to the alternator if it is connected so that filament power comes off one phase, receiver h.t. off the second, and transmitter e.h.t. off the third (on an intermittent basis).

One of our Australian television manufacturers builds his transformers of about 150 v.a. rating at 50 c/s., onto bobbins which are very easily rewound if you can find some in the "disposals" market. If you cannot find any of these, then I feel certain that the bobbins, core and clamp assemblies can be obtained from Anodeon Sales in your own State.

The use of these three separate transformers will permit you to make a power supply, especially for your field day activities, which is designed to take the voltages from a car alternator and transform them to the levels required by the various circuits in your transceiver. There does not appear to be any valid reason why the existing rectifiers in some cases and the filters in all cases cannot be used with this system.—VK3ASC.

"RADIO COMMUNICATION"

May 1969

A Simple Transistor Portable D/F and General Purpose 160 Metre Receiver, G3EDM. Direction finding has gained popularity in Essex through the regular D/F contests held in recent years by Chelmsford and Colchester Amateur Radio groups.

Technical Topics, G3VA, regular feature. Fast squelch with FET gate, adjustable voltage stabiliser, dual gate MOSFET pre-amp; t.v.i. round-up; simple crystal filter; recent equipment. It is perhaps worthwhile to pause awhile and note that details are now beginning to filter through on the Signal/One CX7—"Don't call it a Transceiver". Pat gives some brief details. Aerial tuning unit; the Delta Loop beam, and the round-up concludes with r.f. diode probe.

As Steady as a Rock. G3JGO continues his discussion of crystal oscillators.

A Digital Clock. G3PHG describes a digital clock made from relatively inexpensive components.

A Simple P.S.U. for the BC221, by G3MQT.

Transistors for Amateurs, by G3XIW.

A Roof Rack Fitting Top Band Mobile Whip, G3JBU. Titles are self explanatory on the three latter articles.

"SHORTWAVE MAGAZINE"

May 1969—

In this issue G2HCG, of J-Beam Engineering Ltd., describes the development of a high gain system for 10, 15 and 20 metres, in an article titled "**New Approach to Multiband Beam Design**".

This is followed by Part 2, Circuit details, general layout and construction, alignment and testing of "**Design for a C.W. Transceiver**".

The Eddystone 740 and 750 Receivers, by G3OGR follows. In this article the author gives helpful hints for those wishing to update these tube type receivers which are still capable of giving quite good performance in the hands of someone with a reasonable amount of experience and common sense.

The last article in the issue is **Linear Amplifier for Two Metres,** by G3DAH. Part 1 of the description of a linear using a pair of 4CX250s in p.p. This unit is designed to follow the author's transverter described in the July and August 1968 issues and to run the British legal limit of 600 watts p.e.p.

(continued next page)

"73"

May 1969

This issue is sub-titled "**Antenna Spectacular.**"

Who's Who in Amateur Radio, W8GI. Celebrities in our ranks.

Stacked Gamma Matched Turnstile, WA9LPC. About 10 db. on two metres—omini-directional.

V.H.F. Vacation Special, W2ZRX. Two metre slot antenna from aluminium foil.

S-Unit Attenuator, WA5SWD. For calibrating "S" meters and measuring antenna gain.

In the Beginning, K1YSD. Not for serious Amateurs or heart patients.

Don't Kill Your Generator, W1EZT. Just wound it a little maybe!

Working DX Without Six Elements, K5PAC. Persistence and sneakiness substitute for power.

The Short Vee Antenna, W3FOJ. 10, 15 and 20 metre 56 ft. on a leg and it works. (Is this the G5RV?)

The Little Wonder, W5ZBC. 80-10 metre antenna—looks a lot like the Joystick.

Easy Tuning of the Quad, W4AZK. Multi-element quads can be difficult.

The Antennascope—An Effective Tool, by VE3CEA. It's okay if you know how to use it!

Two on Top, W6AJZ. 80 metre vertical which tunes both ends of the band.

Measuring Antenna Gain, W2EEY. You don't just look around for signal reports.

QRP a New World to Conquer, W6TYP. Where 1,000 watts is a full gallon.

Report on the Galaxy 550, W6AJZ. Great new transceiver, read all about it.

Feeding and Tuning Three-Band Quad, WA4VWY. Boomless Quad, novel approach, etc.

To Patch or Not to Patch, W5LHG. Here's the latest news on patching.

Direct Reading S.W.R. Indicator, K3WRW. Tired of switching back and forth?

Asymmetrically Feeding Long Wires, W2EEY. Strange things happen when you move the feed around.

Compressed Vertical for 160, W6FPO. If you have room for a 120 ft. tower, pass this by.

Class A Transistor Amplifier Design, WA5SWD. Seven steps to total and complete success. Probably.

$4.98 Novice Special, WA7CSK. Why spend more for a nice 15 metre antenna?

How to Fly Your Kite, EI4R. Simple 160 metre antenna for field day or expedition.

In Search of a Better Angle, K9YDE. Angle of radiation is of critical importance.

F.S.K. Exciter, W4LLR. Another bone for the r.t.t.y. fiends.

Telephone Beeper, W6BLZ. Handy gadget for the new phone patch laws.

KW. Dummy Load . . . Cheap, WB2PTU. Start using this instead of your antenna.

Mini-Bomb, W0SYK. Another of his little 10 kw. amplifiers, almost.

DX from DL Land, DL4BR. What it is like over on that end.

Phonetics for the Pile-ups, KH6IJ. How to get your call letters through the mess.

Extra Class Licence Course, by the Staff. Part 4 of the series.

Economy Chronomter, W0EDO. Some Amateurs are pretty cheap.

4X150 Sockets, WA3AQS. Another short-cut for the cheapskate.

All Band Curtain Array, VK4SS. 160-10 metre and only 112 feet long. (VK call signs do not often figure in the credits.)

How to Tune a Circuit, K5LLI. Figuring capacitance and parallel capacitance.

Mobile Antenna for Vacation Use, WB2WYO. Not much trouble and it works.

Plus all the usual features. There are plenty of articles but the quality appears to be slipping a little. Perhaps this is due to "73's" change of Editors.

June 1969

Last month we had an Antenna Special and this month it is a "V.H.F. Special". Some readers may be wondering where all the cryptic comments to "73" articles come from. I wouldn't know, but they are in the index.

New Ways of Generating Microwave Power, K3PBY. New solid state devices you should probably know about.

Modification of V.H.F. Transmitters for C.W. Operation, K1OYB. Moonbounce? Auroral DX? You may need to use c.w.

Mondo Hamme, K1YSD. Read slowly, this may be injurious to your health (mental).

Straightforward S.S.B. for Six Metres, by VE4RE. Build this little beauty next week.

The 432'er Solid State, K1CLL. Bill Hoisington gets you on 432 the fast, easy way.

Six Metre FET CONVERTER, W6RET. If you are still using tubes in your converter, reform.

Compleat A.V.C., W8RHR. Showing how much can really be done to improve a.v.c.

Leaky Lines, K2AGZ. Random thoughts by a random thinker.

Field Day Fever, VK4SS. Your field day should only work out as well.

A Field Day to Remember, W8BVU. Field day can be loads of fun, give it a try this year. This must have been his first.

Sunspots? Who Needs 'Em for Six Metre DX? K7ALE. Okay, so you can work 'em without sunspots, too.

Whipping Two Mobile, K6ZFV. Make your own whip for two metre mobile. Some handy tips on whips longer than lambda over four.

Design of U.H.F. Tuners using Silicon Transistors. Some good ideas for you u.h.f'ers.

How to Convert Your Receiver for Six Metres, W8RHR. Nice little converter for the 75A2 . . . or any other receiver.

Forty, Twenty and Two, WA8IYL. Nice simple vertical antenna using dielectric pipe unions.

A.T.V. Video Modulator, W6ORG. One transistor is all that it takes.

V.H.F., FET, More Of, K6KTP. Pre-amps. for 144, 432, etc.

Simple Scope for R.T.T.Y. Monitoring, W6JTT. Good news for all you r.a.t.t.s.

Curtain Rods Coat-hangers and Control Links, K9STH. V.h.f. and u.h.f. antennas from the closet.

Facsimile and the Radio Amateur, Part 2, K6GKX. Answers to questions about F.A.X.

Soft Solder Construction of Cavities and Lines, WA9VFG. Makes those v.h.f. machining jobs a cinch, almost.

Police Converter, K0VQY. Enjoy the thrills of listening to police calls . . . if it isn't illegal.

The Neglected Mini-Vee Beam, W0LBV. Small and it works like crazy on 10, 15 and 20. You read it here.

Modifying a Tube Converter for FET, W6OSA. Makes a great improvement and doesn't cost much.

A Variable Resistance V.F.O. for Six and Two, K9ALD. Transistors, p.c. board, and tuned from afar. Also very stable.

V.H.F. Bandscanner, WA8OIK. Watch the v.h.f. bands with the ALA-10.

Simple Converter for Slow Scan T.V. and Facsimile, W2LNP. Ridiculously simple, if you want to know. Let's get going.

Confessions of an Appliance Operator, W3ETQ. How to ad-lib in spite of the state of the art.

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AMATEUR GETS JAIL SENTENCE

"QST" reports an event that should be a warning to any ill-inclined Radio Amateurs.

In November, in Bowling Green, Kentucky, K4KHE was convicted on seven separate counts of transmitting obscene, indecent and profane language on Amateur frequencies. The case had been investigated by the F.C.C. and the F.B.I. K4KHE was fined $100 on each of the seven charges, totalling $700. He was also sentenced to six months in jail on each count, each period to run concurrently.

Two other Kentucky Amateurs, WB4AOE and W4EBG, were convicted for similar reasons. They received three months suspended sentence each, and they are on probation for two years. They were also fined $100 each.

"QST" also reports that ex-WN6PNZ, of Hollywood, California, has been denied an Amateur licence due to consistent past violations of F.C.C. rules.

VICTORIAN DIVISION, W.I.A.

V.H.F. CONVENTION

will be held on

SATURDAY and SUNDAY, 11th and 12th OCTOBER, 1969

at

MOONDARRA RESERVOIR

near MOE, Gippsland

Meals, Accommodation and Registration, approx. $5 each.

Trade Displays, Fox Hunts, Scrambles, Lectures, Bus Tours—the lot as usual.

Further information Convention, P.O. Box 36, East Melbourne, Vic., 3002

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

Not much news at this time of the year. The most interesting to date is special prefix that has been allocated to us for next year, although primarily for operators on the lower frequencies they can be used by Limited licensees if they so desire. As yet no form of award has been decided upon for v.h.f. operators, it is still possible that one could be made.

Heard on the grapevine that VK3 may have a two metre beacon later on this year and it is completely solid state. 73, Cyril VK3ZCK.

VICTORIA

In a recent two metre scramble on a cold Sunday night, 26 stations were heard exchanging numbers; for this time of the year it is a large gathering. Unfortunately on cold nights contacts can be hard to obtain.

A variation in scoring is being made in the form of a handicap for those who have won a scramble in the past couple of months. It is hoped that this new system will give more incentive to those who have the attitude "I won't bother taking part as I have not got a hope". Full details will be announced on the Sunday broadcast on the Sunday of the scramble.

The VK3 V.h.f. Group holds its monthly meetings on the third Thursday of each month at 2000 hours E.A.S.T. and visitors are always welcome. Fox Hunts are held on the Friday of the week following the Group meeting. Scrambles are on the second Sunday of each month.

During the summer months Field Days are held at frequent intervals. The dates of the forthcoming Field Days are: Sunday, Oct. 26; Sunday, Nov. 16; Sunday, Dec. 14; Thursday, Jan. 1; Sunday, Jan. 25; Sunday, Feb. 15; and Monday, Mar. 30.

The V.h.f. Group will hold its 1969 Convention over the week-end 11th and 12th October at the Moondarra Reservoir, near Moe in Gippsland. Further details appear elsewhere in this month's "A.R."

AROUND AND ABOUT

The VK7 two metre beacon VK7VF, which is located at Devonport, Tasmania, is again operating on 144.9 Mc. after having repairs and maintenance completed. The beacon transmits its call sign in m.c.w. and has a power input of 15 watts to a QQE03/12, which is loaded by a pair of big wheels.

John VK3TN, ex VK5HP, is contemplating building a 10-foot diameter dish to use on 1296 Mc. John is planning to join the many others who have already operated on this band and those planning equipment.

The Christchurch, New Zealand, beacon is on 145.0 Mc. and runs 20 watts input to a QQE03/20 and, like all ZL beacons, uses the suffix VHF. Christchurch has a two metre translator, input frequency of 144.65 and an output frequency of 145.775 Mc. and is designed for amplitude modulation.

Proposed ZL f.m. net frequencies are 145.8, 146.0 and 146.2 Mc., with a maximum deviation of plus or minus 6 kc., polarisation vertical.

An interesting article in the W.A. V.h.f. Group Newsletter is about a system of cathodeless valves using Thorium 234 as the electron source.

The above information was gleaned from various magazines and newsletters.

W.I.A. 52 Mc. W.A.S. AWARD

Cert. No.	Call	Additional Countries
	New Member:	
85	VK4VX	-
	Amendments:	
26	VK4ZAZ	8
50	VK2ASZ	3

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RE LOG BOOKS

A query raised at Canberra as to the length of time it is obligatory to keep a log book has been answered by the Department as paraphrased.

The log book showing the record of transmissions should be available for inspection 12 months from the date of the last entry.

NEW CALL SIGNS

MAY 1969

VK1AR—A. S. Radford, 50 Gouger St., Torrens, 2607.
VK1ZEB—E. J. Barnes, 26 Dennis St., Garran, 2605.
VK1ZVT—D. S. Thomas, 5/17 Devonport St., Lyons, 2606.
VK2AU—J. B. Thomas, 81 Hanbury St., Wentworthville South, 2145.
VK2CA—R. M. Harnett, 40 Hermitage Rd., West Ryde, 2114.
VK2DG—A. J. Gillham, 34 Neerim Rd., Castle Cove, 2069.
VK2EV—J. R. McArthur, 136 Brighton Ave., Toronto, 2283.
VK2OA—N. S. Hill, 14/749 Pittwater Rd., Dee Why, 2099.
VK2SB—R. W. Chaplin, 40 Charlton St., Nambucca Heads, 2448.
VK2BAR—B. A. Ritchie, 97 Deutcher St., Temora, 2666.
VK2BBJ—A. D. Swinton, 547 Pennant Hills Rd., West Pennant Hills, 2120.
VK2BGR—G. J. G. Smith, 18 Macassar St., Cowra, 2794.
VK2BIN—I. T. Nance, 34 Spruce St., Blacktown, 2148.
VK2BLG—L. Grimshaw, 28 Cliff Rd., Collaroy, 2097.
VK2BLM—L. Morrison, 3 Evans St., Peakhurst, 2210.
VK2BMD—M. A. Du Feu, 34 Ivey St., Lindfield, 2070.
VK2BNL—L. J. Yates, 26 Bulwarra Rd., Eleanora Heights, 2101.
VK2BPV—P. J. Vernon, 10/7 Gilbert St., Dover Heights, 2030.
VK2BPW—P. G. Wickenden, 115 Victoria St., Lewisham, 2049.
VK2BSI—S. G. Riley, 36 Teviott St., Richmond, 2753.
VK2BSN—N. A. Spratt, 1 Ventura Ave., Miranda, 2228.
VK2CAS—A. G. Svenson (Sqn. Ldr.), 53 Cox St., Windsor, 2756.
VK2ZHG—H. J. Ferrall, 338 Moore Park Rd., Paddington, 2021.
VK2ZKC—K. M. Cunningham, 55 Marshall St., New Lambton Heights, 2305.
VK2ZLU—L. A. McKenzie, 106 Ashmont Ave., Wagga Wagga, 2650.
VK2ZNN—N. N. Watson, 30 Rossford Ave., Jannali, 2226.
VK2ZNR—B. J. Byrne, 2 Lavai Pl., Beacon Hill, 2100.
VK2ZPY—R. A. Girdo, Station: 111 Cooper Rd., Birrong, 2143; Postal: P.O. Box 324, Bankstown, 2200.
VK2ZPZ—W. Frost, 98 Young St., Cremorne, 2090.
VK2ZRW—R. R. Winston, 20 Cooper St., Cessnock, 2325.
VK2ZSX—R. A. Wells, 11 Astley Ave., Padstow, 2211.
VK2ZTP—J. P. Tomkins, 78 Aberdeen St., Muswellbrook, 2333.
VK2ZVO—R. P. Tester, 78 Lachlan St., Cowra, 2794.
VK2ZZV—B. Z. Vlcek, 100 Murray St., Tumbarumba, 2653.
VK3WJ—F. S. Kantor (Dr.), 22 Castella St., East Ivanhoe, 3079.
VK3AFS—R. G. Rowlands, 35 Cratloe Rd., Mt. Waverley, 3149.
VK3BAB—S. W. Platt, 2 Robinson St., Moe, 3825.
VK3BAK—V. H. Niedeck, 19 Talofa Ave., Ringwood East, 3125.
VK3ZWY—E. W. Ferrier, 178 Alma Rd., Balaclava, 3183.
VK4FZ—E. B. Hall, 10 Kenilworth St., Sherwood, 4075.
VK4KJ/T—L. Cordell, 12 Nesbit St., Southport, 4215.
VK4MJ—K. M. Kelly (Dr.), 285 Monaco St., Surfers Paradise, 4217.
VK4NV—E. Robinson, Station: Menso's Rd., Maidavale, via Ayr, 4807; Postal: P.O. Box 491, Ayr, 4807.
VK4OA—J. P. Baker, 18 Valiant St., Chermside West, 4032.
VK4PI—P. R. Tompson, 13 Comus St., Hamilton, 4007.
VK4QU—R. D. Ross, Station: 43 Wentworth Tce., Rockhampton, 4700; Postal: C/o. Commonwealth Bank, Rockhampton, 4700.
VK4VE—Teachers' College Radio Club, Victoria Park Rd., Kelvin Grove, 4059.
VK4WZ—W. E. Purser, 2/26 Guildford St., Kelvin Grove, 4059.
VK5GO—F. D. Voight, 67 Crittenden Rd., Smithfield Plains, 5114.
VK5SB—I. S. Brown, 5 Indarra St., Taperoo, 5017.
VK5XJ—C. A. Pryzibilla, 42 Burbridge Rd., Brooklyn Park, 5032.
VK5ZBA—B. T. Pointon, 5 Caroline Ave., Belair, 5052.
VK5ZFH—G. L. Stephens, 3 Bickford St., Richmond, 5033.
VK5ZJO—J. C. Willoughby, 30 Geraldine St., Valley View, 5093.
VK5ZKO—B. T. Parker, 10 Regent St., Pennington, 5013.
VK5ZLY—G. D. Trowbridge, 19 Raleigh Ave., Flinders Park, 5025.
VK5ZMO—D. M. Clegg, 6 Reynell St., West Croydon, 5008.
VK5ZRG—R. W. Greeney, 60 Illawarra Ave., Hove, 5048.
VK6DY—F. H. Smith, 93 Empire Ave., Wembley Downs, 6019.
VK6GN—G. E. Nixon-Smith, 385 Grand Promenade, Dianella, 6062.
VK6LZ—B. Telford, Station: Portable; Postal: Ruru Ave., Otatara R.D. 9; Invercargill, New Zealand.
VK6MC—W. R. Attwood, 45 Coventry Rd., Shoalwater Bay, 6169.
VK6PZ—P. Zeid, 34 Williams Rd., North Dianella, 6062.
VK6RL—R. F. Henwood, 43 Taylor Rd., Claremont, 6010.
VK6ZGF—J. A. Hassell, Flat 16, 367 Stirling H'way, Claremont, 6010.
VK7KW—C. S. Perger, 37 Galvin St., Launceston, 7250.
VK7RJ—R. H. Waldon, 11 Mayne St., Invermay, 7250.
VK7RV—R. Chamberlain, 23 Lincoln St., Lindisfarne, 7015.
VK7TF—T. W. Firth, 11 Rosewood Rd., Risdon Vale, 7016.
VK7ZNR—A. N. Richardson, 53 Cameron St., Launceston, 7250.

CANCELLATIONS

VK2LW—L. W. F. Waugh. Deceased.
VK2MY—J. F. McGregor. Not renewed.
VK2TV—W. G. Weiss. Not renewed.
VK2VI—V. J. Gay. Not renewed.
VK2YO—G. H. Younger. Deceased.
VK2ADZ—G. Harriman. Deceased.
VK2AFB/T—F. C. Barron. Deceased.
VK2AGN—G. E. Nixon-Smith. Now VK6GN.
VK2ALH—F. M. Scanlon. Not renewed.
VK2AZB—J. K. W. Bork. Not renewed.
VK2BAQ—A. G. Svensen (Sqn. Ldr.). Now VK2CAS.
VK2BMT—M. R. Travena. Not renewed.
VK2BUA—U. H. Aalbers. Transferred to Vic.
VK2BZZ—G. A. Bentz. Not renewed.
VK2ZFR—D. K. King. Not renewed.
VK2ZHU—A. J. Hughes. Not renewed.
VK2ZIJ—I. R. Johnston. Not renewed.
VK2ZJB—S. J. Brown. Not renewed.
VK2ZKI—J. B. Thomas. Now VK2AU.
VK2ZLD—L. W. Doolan. Not renewed.
VK2ZLQ—L. E. Peasley. Not renewed.
VK2ZPC—P. J. Carter. Not renewed.
VK3ABC—F. D. Voight. Now VK5GO.
VK3ZKQ—D. W. F. King (Cpl.). Transferred to A.C.T.
VK3ZKZ—D. V. Hambleton. Transferred to Western Aus.
VK3ZPL—S. W. Platt. Now VK3BAB.
VK3ZYZ—A. B. Hamilton. Not renewed.
VK3ZZN—N. J. Spalding. Transferred to New Guinea.
VK4JD—J. L. Thomason. Transferred to N.S.W.
VK4NH—N. S. Hill. Now VK2OA.
VK4PN—P. Lyons (Rev.). Ceased operation.
VK4WA—W. R. Attwood. Now VK6MC.
VK4ZHH—E. B. Hall. Now VK4FZ.
VK4ZLB—B. J. Byrne. Now VK2ZNR.
VK4ZQT—Teachers' College Radio Club. Now VK4VE.
VK4ZRL—R. D. Ross. Now VK4QU.
VK5HP—J. H. Lehmann. Transferred to Vic.
VK5PO—A. M. Perriman. Not renewed.
VK7DE—D. E. Burkinshaw. Not renewed.
VK7KT—C. Lindsay. Not renewed.
VK7LL—K. M. Kelly (Dr.). Now VK4MJ.
VK7SS—P. R. Tompson. Now VK4PI.
VK7ZCP—C. S. Perger. Now VK7KW.
VK7ZHF—H. J. Ferrall. Now VK2ZHG.
VK7ZRJ—R. H. Waldon. Now VK7RJ.

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ERRATA

In the July issue of "A.R." some drafting errors appeared in "300 W. P.E.P. 2 Metre Transmitter." The inductance in the cathode of V7a (overtone oscillator) should be 2.5 μH., not mH. The emitters in the two transistor stages are not marked. They each have a 470 Ω resistor to earth, which will identify them. The second transistor stage is not an emitter follower as marked, but is an untuned amplifier.

Wagga District Radio Club

The Club was inaugurated at a general meeting in June 1968 and is a member of the Wireless Institute of Australia. Part of the Club activity is to provide the local Civil Defence Organisation with a communication branch and operations are conducted in the Civil Defence Headquarters. Operations began in the temporary premises of the Civil Defence and are now conducted in the permanent quarters of the Civil Defence. A high proportion of Club members are also active members of Civil Defence.

The electronic equipment provided by the Club consists of a 50w. 146 Mc. f.m. base station, eight 10w. 146 Mc. mobile stations, and a 7 Mc. base station. Base stations are operated by members on a roster basis. The future developments are expected to include the provision of a second 50-foot aerial tower and single sideband transceivers by the Civil Defence Organisation and a 146 Mc. f.m. repeater station operated by the Club to give a very good coverage of the locality. This latter project is already well in hand and should be operational by December of this year.

Another important aspect of the Club activity is fostering of Y.R.S. activity by Brother Jeffrey, VK2HI, at the Christian Brothers' College and progress has been such that other Y.R.S. stations will be in operation during the coming year.

An active programme has been followed in the year centering around A.O.C.P. instruction so that five new licences have been gained by members. Further activities for members are planned including participation in all major VK contests, Jamboree-on-the-Air, v.h.f. hidden transmitter hunts, field days, inter-club visits and contests, club sponsored construction projects, while continuing to offer A.O.C.P. training in theory, Morse code and regulations.

Club members feel that the activity is furthering the interests of Amateur Radio in the Wagga Wagga area and providing a valuable public service through the links with Civil Defence Organisation. Enquiries with regard to the Club should be made to the Hon. Secretary, Wagga District Radio Club, 106 Ashmont Avenue, Wagga Wagga, 2650.

OBITUARY

JOSEPH GRIFFITHS REED, VK2JR

It is with deep regret that we record the sudden passing of one of the real "Old Timers," Joe Reed, VK2JR. Joe died suddenly on 29th July.

He had a long career in the world of radio, in fact dating back to at least 1910 when he was just a schoolboy. Space does not permit a full listing of all Joe's contributions to radio whilst employed by the Navy, P.M.G's Department, A.W.A., etc.

He was a regular contributor to "Amateur Radio" and was responsible for many tapes in the VK2 Division library. He was never too busy to help anybody with a problem and a question to him resulted in several typewritten pages and diagrams in the next day's mail.

To his family, we convey our condolences and assure them we feel their loss as much as they themselves.

VICTORIAN DIVISION, W.I.A.

WESTERN ZONE

CONVENTION

HALLS GAP

25th and 26th OCTOBER, 1969

Accommodation available. Dep. $2.

MOTEL, GUEST HOUSE, or CARAVAN PARK

Bookings to: "Convention," P.O. Box 25, Ararat, Vic., 3377.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

This month has produced some relatively good openings here and there with ten metres opening at all sorts of odd and interesting hours. However, the higher frequencies have shown the steady decline predicted, but in contrast there have been some good openings to many parts of the world on 80 metres which has become less noisy due to the winter period. No information whatsoever has reached me from VK sources other than what has been heard from Divisional broadcasts, so most of the following information has been taken from the usual overseas bulletins.

At the time of writing, Gus W4BPD had cut short his jaunt in the VQ9 area due to transport difficulties, and last heard, he was heading for Kenya.

YB1ZZ has been logged here in Australia, and has a very fast QSL return if sent to M. H. T. Patah, Let. Kol. Police Force, Box 8, Bandung, Indonesia.

From the Long Is. DX Ass., here is an account of the recent operation by K4IA/KC4 from Navassa Is. QSLs for which should go to WA4WIP, G. Tesar, 2666 Browning St., Sarasota, Fla. The arrival of operators K4CAH, W4DQS, W4PJG, W4KET, K4IA, W4WXZ and W4CKB was delayed several hours, however no difficulties were planned and the first QSO was made at 2040z on 7.205 Mc. with 6Y5LA who had been monitoring the frequency for almost nine hours. Three stations were put on the air, the first night, on all bands except 75 s.s.b. and 160. The following morning antennae for these two bands were raised, along with two other triband beams, giving a total of three triband beams, one vertical, two inverted Vs, and one long wire across Lulu Bay. Two Drake TR4/RV4s and two Drake T4XB/R4B combinations were powered by a single 1750 watt generator which packed up on the second morning. A spare 1250 watt generator was put into operation until the other was repaired later that day.

On the afternoon of 25th, dismantling commenced, with the last QSO being sent at 1940z after 71 hours operation. Due to the slower boat, they had to leave Navassa 12 hours earlier, nevertheless 11,162 QSOs were made with good coverage to all continents.

You will note in the QTH section of July "A.R." I listed Jack C2IJW as C2. Jack has to QRT at about 1140z daily, but as he will be on Nauru for three years there will be plenty of time.

ZK2KR has been heard in the mornings working Europe on 20 metre c.w., giving his QTH as Niue and QSL manager W2CTY.

Aland Is. operation recently reports on 7 and 14 c.w. and s.s.b., says QSL to home address Box 40015, Helsinki, Finland. The station has been reported at good strength from VK3.

The prefixes PQ, PR, PS, PT and PU, which were active during the W.P.X. Contest back in April, were all Brazilian and 100 stations from that country were issued with them.

Currently active from Jan Mayen Is.: JX-1OM, JX2BH, JX3DH, JX3NM, JX3P, JX3XK and JX5CI. Average time of activity as listed in a report seems to be from 1400z to 2000z. JX3DH is the only one shown as active on 7 Mc., actually 7055 s.s.b.

The special call sign PE2EVO, active on 14 s.s.b. at around 1500z, is situated in the Phillips Co., Netherlands.

I didn't note just who said it, but I gleaned from the Pacific net on 4th July that a weather station is being built on Bouvet Is. and will have Amateur activity.

KF7BSA, who was in great demand during the Pacific Net on 18th July, was operating from a Scout Jamboree in Idaho.

The operation of LI2B on the ill-fated trip across the Atlantic by Thor Heyerdahl in "Ra" has had sufficient coverage in the daily press, however many Amateur contacts were made and Thor says that QSLs will be ready by the end of August, and should go via LA5KC, Box 150, Slependen, Norway, with five IRCs for the handicapped children's fund.

KH6EDY, still working from Kure Is., is always a pleasure to hear. The way this guy handles the "screaming heap" is really something. Frequency is 14020 and QSL to Box 36, F.P.O., San Francisco, 96614, U.S.A.

Sad to report the deaths of two well known DXers. Charles HB9ADO passed away on 11th April and Arne SM5PW on 29th March. Arne was well known for his /MM operation and his YU7LAE jaunts, whilst Charles was better known for his activity as 4W1ADO.

Martin G3VOF, together with other Amateurs, G3VQY, WAB and XQC, are active most days from Billericay in Essex on 14 s.s.b., and are anxious to know how their signals are getting out. They will appreciate QSOs from this part of the world, also will answer any reports. QSLs can go via I.S.W.L. Bureau.

The station signing HU1P was quite in order. This prefix is used in El Salvador for special activities such as contests.

Regular operation from Taiwan can be found on 14027 c.w., where BV2A is crystal controlled. His operating time is 1130z to 1430z, and QSLs via WB2KUP for American stations only.

Monitor, the official magazine of the I.S.W.L., reports that a station signing 2B3DC claiming to be in Biafra has been worked, however at this stage it will not count due to the political situation, and lack of licensing authority.

Operation from West Pakistan by Ahmed AP2AD continues. He is operating transceive on 14205 s.s.b. and handling the dog piles really well. He has been worked in VK at about 2100z, whilst other reports show him active at many other times. QTH: Box 94, Lyallpur, West Pakistan.

An unexpected operation occurred on 14233 recently when OH2BH/OHO/SR came on from Skarp Reef in the Baltic from 0150z to 0400z in the one day. It is not a new country at this stage, but in keeping with the common trend, it could well be. Says QSL to OM2AM/Skarp Reef.

If you have been waiting for a card from EA9AA, don't despair, he has had new cards printed and they are in the process of being issued, to try and offset the backlog.

From LA7RF comes the news that JW1CI will be on Bear Is. for a year and will be joined by JX3XX signing JW3XX in September at the QTH of Walrus Bay. DXCC credit for Svaalbard. QSL to LA3T.

Recent activity from GD3LNS and GD3KDB went off very well, with good contacts on 7 Mc. QSLs go to G3LNS and G3KDB, or to QSL manager WB2YQH, Robt. Nadolny, 72 S. Pierce St., Buffalo, N.Y., 14216.

The proposed trip by WB6KBK and HK operators to Serrana Bank and Roncador Cay has been cancelled as permission was not forthcoming.

TF3IRA is the DX-pedition by Haddi and Berger working transceive on 14189. Not an easy country to find, but they have been active at around 0300z, with QSLs to Box 1058, Reykjavik, Iceland.

Operation from Kuwait is plentiful at present with 9K2BF operating transceive on 14220 (Box 1083, Kuwait); 9K2AA, on 14201, and 9K2BI listening on 14275 transmitting 14196 at 0220z. QSL to Box 8419, Kuwait.

F0US FC will be W1PRI and XYL, together with HB9TL. Bob planned to operate /AM on the way over, and their operating frequencies were listed as 14240 and 21310. Other Corsican operation by F2FD/FC on 14027, QSL to home QTH or F bureau.

Recent operation by VS5MC from Brunei successfully completed and the operator, Maurice VS6AA, back at home QTH. The QSL manager for this operation is K8UDJ, Charles Hutchinson, 2072 Rolfe Rd., Mason, Michigan, 48854. VS6AA has skeds with K8UDJ on Saturdays at 1500z on 21080.

The following is a summary of recent VP2 activity. VP2AZ (op. K5AAD). QSL to WA-5LES; VP2s KK, LZ and VI to W3EVW; whilst VP2VT goes to the operator's home QTH VE-2AFC, and VP2VK is at Box 1737, St. Thomas, Virgin Is., 00801.

KC6AT is active from the East Carolines. He has been active on 14230 from 1000-1200z and QSLs go to Box 94, Ponape, East Caroline Is., 96941.

Further operation reported from Alland Is., this time by DL7NS, OH0, who expects to be active during August and September on 3510, 7010, 14050, 21050 and 28050 c.w., Sundays from 1200z for one hour on each band. QSLs to DL7MQ.

Gilbert TI8GL is now QRT and will not be returning. Logs of the operation are available and QSLs should go to VE2DCY, Bernard Leblanc, 8900 Lacordaire, Montreal, 458, P.Q.

Operation from Tristan Da Cunha by Roy G3KDY continues, he is listed to stay there for 2½ years. He is listed on all bands, but a challenge would be his operation from 3798 s.s.b., where he is every Saturday and Monday from 2100. Little hope from here at that time. QSL to GB2SM.

QSL MANAGERS

3A2EE—DL7FT.
3V8AD—DL1IA.
5A1TY—HB9ADP.
5A2TR—DL9OH.
5A3TX—WA3HUP.
5H3LV—VE3ODX.
5L2BJ—WA3HUP.
5L2D—W5EJ.
5L2VAT—EI2E.
5R8AN—K4IE.
7G1CG—WA3HUP.
8R1S—VE3DLC.
8R1X, U, Z—VE3DLC.
9H1L—G3VPS.
9M1MM—W3KVQ.
9M2AE—W7EPA.
9Q5DZ—W2LGV.
9Y4RU—K8LSG.
ZB2AY—K3RLY.
ZB2BS—G3PSM.
ZD8Z—W6CUF.
ZE1DC—WA9UES.
ZF1AA—K2OLS.
ZF1AR—W8ROF.
ZF1DT—K4AYO.
ZF1RD—K8LSG.

SOME QTHs

5A3TK—Box 3184, Tripoli, Lybia.
5L2BA—Box 987, Monrovia, Liberia.
6W8BJ—B.P. 62, Thies, Senegal Republic.
7P8AR—Ulli Dehning, Box 194, Maseru, Lesotho.
8R1J—P. Taylor, Box 557, Georgetown, Guyana.
8RIT—Sonia Blue, Box 25, Georgetown, Guyana.
9G1DY—Norman Price, Box 44, Tarkwa, Ghana.
9M6HM—C/o. Police Hdqrs., Kota Kinabalu, Sabah.
9X5SP—Deutsche Welle, B.P. 420, Kigali, Rwanda, Africa.
TY6TAE—Box 107, Natitingou, Dahomey Rep., Africa.
WN7JKQ—Les Bowman, 1650 Hawthorne St., Forest Gve., Ore., 97116.
YB0AR—J. Hartadi Kertayasa, Gunung Sahari 51, Djakarta.
YK1AA—Rasheed Jalal, Box 35, Damascus, Syria.

AWARDS

The Lincoln Century Award is issued by the Lincoln Short Wave Club to Amateurs and S.w.l's alike, with no date limit for contacts; endorsements for band and mode; cost is 7/6 or one dollar U.S. or 10 IRCs. Issued in five classes, class E with 100 points through to class A with 500 points. Points are issued thus:

Stations in the Lincoln Postal District, England	20 pts.
Stations in the county of Lincolnshire, England	10 pts.
Stations in the Lincoln Country of U.S.A.	10 pts.
Lincoln Short Wave Club Station G3IXH	30 pts.
Stations in any other world town of Lincoln	20 pts.

Contacts on v.h.f. and with C.H.C. or F.H.C. members are double. Send certified lists of QSLs with exact QTHs of all Lincoln stations to Stew Foster, 68 Goldsmith Walk, Lincoln, England. There are no Lincolns in VK, however we might get away with VK2's Lincolnville. How about it Stew?

With that lot, I shall climb back up the ladder and prepare some sort of an antenna for the forthcoming VK/ZL Contest.

My thanks to Eric Trebilcock, Maurie Batt, Benrard Hughes, Geoff Watts DX News-sheet, I.S.W.L. "Monitor," Steve Ruediger, VK2 Broadcast, Long Is. DX Assn., and Mac Hilliard, for information supplied. See you next month. 73 de Don WIA-L2022.

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CONTEST CALENDAR

4th/5th October: VK/ZL/Oceania DX Contest (Phone).
4th/12th October: Lebanese DX Contest.
11th/12th October: VK/ZL/Oceania DX Contest (CW).
11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.
18th/19th October: W.A.D.M. DX Contest (CW only).
25th/26th October: "CQ" W.W. DX Contest (Phone).
25th/26th October: R.S.G.B. 7 Mc. Contest (CW).
9th November: International OK DX Contest (CW only).
8th/9th November: R.S.G.B. 7 Mc. Contest (Phone).
15th/16th November: R.S.G.B. 1.8 Mc. Contest.
29th/30th November: "CQ" W.W. DX Contest (CW).
6th Dec. 1969 to 11th Jan. 1970 Ross A. Hull V.h.f. Memorial Contest.
6th/7th December: C.H.C. International DX Contest (CW).
13th/14th December: C.H.C. International DX Contest (SSB).
1st/2nd February: John M. Moyle National Field Day.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

PARTICIPATION BY LIMITED LICENSEES

Editor "A.R.," Dear Sir,

I was very pleased to read in the August edition of "A.R." the plans for Amateurs to celebrate the Cook Bi-Centenary/W.I.A. Diamond Jubilee and especially the Bi-Centenary Award.

My only disappointment is the exclusion of Limited Licensees from this award. I don't need to point out that the rules would exclude us but they state, "Available free to any licensed Amateur throughout the world".

Although, due to our band allocations we are unable to convey our feeling of pride to overseas stations, surely we can do this on a more local basis in the country whose Bi-Centenary we are celebrating. Granted it would be difficult setting up rules for such an addition and make it fair for country and city Amateurs alike, but at the cost of complete exclusion I am confident something could be arranged.

How about an Amateur with less than 25 ACTIVE Hams in a radius of 100 miles contact 20 of them to qualify for this award? And those in more densely populated areas a proportionly greater number.

—Peter Collins, VK3ZYO.

COPIED C.W. VISUALLY

Editor "A.R.," Dear Sir,

The resourcefulness by which a person who has no hearing has let himself into the field of Ham Radio prompts me to write to this column.

Some time ago I had a card from Jan Verstelle, a Dutch S.w.l. reporting on my contact with a DJ. Jan pointed out that he could not give me a tone report because he was deaf. He had no means of copying speech, but displayed c.w. on a cathode ray tube and copied it visually. Presumably he wrote as well as he could without taking his eyes off the tube.

I sent Jan a QSL and told him that I had put his card among the few I pinned up in the shack for affectionate or honourable reasons and today I had a letter from him, and I give it here verbatim:

> "Dear Tony. I beg your pardon that I write bad English and thank you for your card. It is nice that my card attracts you and you put it on the wall. I have now three cards from your country, all three 100 per cent. by post.
>
> "Now I am very busy making a Morse computer because it is difficult to read c.w. on the tube and at the same time to write it down.
>
> "I hope you demonstrated my card to deaf people in your surroundings because many deaf people in Holland think that they cannot be a Radio Amateur and do not dare to take hold of it.
>
> "I think probably I am the only one in the world and I enjoy my shack very much. When I have finished my computer I shall study to be a Ham. Regards to your family from my wife who is also deaf.
>
> —Jan Verstelle, NL915."

Not only did Jan's effort impress me very much in its own right, it brought home to me that this is another instance of c.w. being able to reach where nothing else can. Though I have top class modern s.s.b. gear, I can rarely be lured into using phone and am particularly glad that I was working c.w. when Jan was "having a look round the band".

—Tony Brinkley, VK1SG.

NOVICE LICENCE

Editor "A.R.," Dear Sir,

Prompted by two letters in August "Amateur Radio" I would like to register my support for a Novice Licence. I do not intend to introduce any new arguments in favour of such a licence as there has been sufficient said on the matter by others. I also believe that a Novice Licence is essential to the future development of Amateur Radio in this country. I feel that many of the objections raised by the opponents of a Novice Licence scheme are frivolous and display prejudice.

The fact that I or anyone else found it easy to obtain an A.O.C.P. is no argument against having a Novice Licence. Also I cannot understand the Victorian Division in having the age limit lowered to 15 for a full licence as an alternative to a Novice Licence. The lower Morse speed limit also has doubtful advantages. Surely a lower class licence would be a better apprenticeship for a young licensee.

On a slightly different note, I do not go along with this gloomy and inferioristic view of the hobby as presented by R.C.B. I do not believe it is necessary or right to justify ones own existence. Modern society is oriented to the benefit of the individual. The community provides large areas of land for people who like to play golf, air space is provided for those who wish to fly aeroplanes for relaxation, and parts of the seashore are provided for yatching clubs. No one would think of taking these away just on the grounds that they were unjustified in keeping them. So do we have frequency bands provided for those who enjoy communications as a hobby. This is just part of the privileges of a modern free society.

To remove Amateur Radio would be a threat to all minority groups who enjoy special privileges. Most people belong to some privileged minority, either in business or pleasure. Continually asking the Radio Amateur to justify his own existence could have an opposite effect to the desired result. The authorities may become convinced that we ourselves do not think we are justified in keeping our hobby, with disasterous results.

There is, however, a certain amount of undesirable operating creeping into activity on the bands. Conversations and operating which are not quite in accordance with regulations and standard Amateur practice are a bad thing for our image. This is apparently becoming a problem overseas, judging from articles in overseas magazines (reference Editorial, "QST" Feb. 1969). Standards seem to be changing and who can tell what will be right or wrong in the future.

J. A. Adcock, VK3ACA.

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Book Review

POPULAR TUBE AND TRANSISTOR SUBSTITUTION GUIDE

Contents: Popular receiving tubes (1733 substitutes for 770 original types); industrial and commercial tubes (264 substitutes for 142 original types); American substitutes for foreign tubes (985 substitutes for 793 types); tube circuit and base diagrams; popular transistors (2248 substitutes for 454 original types); American substitutes for foreign transistors (1486 substitutes for 301 original types); general purpose transistor substitutes (606 substitutes for 150 original types); transistor base diagrams and manufacturer abbreviations.

TAB Book No. 491, 160 pps., 8 sections, Price: $US4.95 leatherette bound, $US2.95 paper.

THE OSCILLOSCOPE

New Third Edition

By George Zwick

A completely re-written, up-dated edition of the classic work on understanding and using oscilloscopes. Completely expanded and updated to include triggered sweeps, dual-trace scopes, electronic switches for multi-waveform displays, d.c.-to-d.c. supplies, d.c.-to-a.c. inverters, and d.c.-to-d.c. converters, this brand new book is right up to date on the current state of oscillography. All the useful data of the previous edition has been up-dated to include the latest information in keeping with technology. It is a virtual handbook on the subject, explaining scope operation from the simplest to the most intricate uses.

Beginning where the scope manual stops, the author covers basic waveforms (d.c., sine, sawtooth, trapezoid and pulse) clearly detailing their generic characteristics and how they are interpreted in oscillography. Scope operation, from the c.r.t. screen to the power supply, is thoroughly explained in chapters devoted to the cathode-ray tube and sweep systems (including triggered sweep). To give practical meaning to scope design, the author literally "takes apart" four current models, thus enabling the reader to better understand what they'll do for him.

Chapter 5 shows how valuable the scope is in radio and t.v. alignment, as the author explains various techniques, applicable to everyday as well as unique situations. Further tests and measurements are divulged in later chapters audio measurements, power output calculations, video, hum, current plus special oscilloscope techniques, probes, etc.

Of special value are the numerous experiments in the final chapter. Included are 17 step-by-step procedures specifically planned for familiarisation with the methods for performing tests and measurements with an oscilloscope. Here the reader will find the information needed to make comparisons of direct and amplified signals, detect audio signal distortion, observe transmitter modulation percentage, employ square-wave response tests, perform capacitor leakage measurements, set up dual-trace displays, analyse and interpret various waveforms, understand and use various probes, and many other important aspects of practical oscilloscope application.

An extremely valuable reference and guide for those now using scopes and those who would like to begin.

TAB Book No. 498, 256 pages, over 170 illustrations, eight big chapters. Price: $US7.95 hardbound, $US4.05 paper.

AUDIO SYSTEMS HANDBOOK

By Norman H. Crowhurst

This brand new, authoritative handbook is just what the title suggests—a reference and guide to audio system design, as useful for engineers and technicians as well as for audiophiles. It encompasses home entertainment, commercial sound and studio installations. Based on his extensive experience in the field, the author approaches each subject in a practical way. Where theory is essential to an adequate presentation of the facts, it is boiled down to its simplest terms.

Chapter 1, covering amplifiers and amplication, explains db. and impedances, level limitations, insertion gain, plus a host of other basics necessary for practical system design. The author goes to great lengths to impart an understanding of these vital ingredients as they apply to overall operation. The same may be said of his treatment in succeeding chapters on equalisers, mixers and filters, distribution systems, programme sources, commercial systems (public address, background music, intercom, paging, etc.), studios and loudspeaker systems.

"Audio Systems Handbook" imparts a firm knowledge of microphone characteristics, loudspeaker utilisation, and other factors required to make up a really good system. It provides an understanding of such terms as loudness compensation, constant-voltage lines, low-level distribution, electronically-generated audio, frequency-shift speaker feeds, noise suppression, reverberation, pre-emphasis, power margin, electrical and electronic crossovers, and much, much more. The reader will learn how to put a system together, the requirements of commercial sound installations, the standards of studio (recording and broadcast) audio facilities, and the rudiments of loudspeaker systems —both mono and stereo, outdoor and indoor. This is a design handbook which tells you how to evaluate and select systems and components, how to install them for flawless performance, and how they may be operated for greatest overall efficiency. It also contains much information which will aid in locating troubles.

TAB Book No. 494, 192 pages, 125 illustrations, 10 chapters. Price: $US7.95 hardbound, $US4.95 paper.

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SILENT KEYS

It is with deep regret that we record the passing of the following Amateurs:

VK2JR—J. G. Reed.
VK4CK—Len Schnitzerling.
VK4CL—Joe Waterworth.
VK4DK—John Kelly.

FEDERAL CONSTITUTION CHANGE OF W.I.A.

Notice of Motion following has been given to Federal Executive by the Victorian Division of the W.I.A.:

"That Clause 62 of the Federal Constitution be amended by deleting the word 'March' and inserting in lieu thereof the word "January', and that further, in the interpretative clauses of the Federal Constitution the definition of the term 'Fiscal Year' be deleted and in lieu thereof be inserted 'Fiscal year means the year commencing the first day of January in each year'."

The effect of this is to change the financial year's commencing and finishing dates to allow more time for the preparation of audited statements to be submitted to the Federal Convention.

Article 70 of the Federal Constitution requires the publishing of this notice in two consecutive issues of the Institute's official journal.

—Peter D. Williams, VK3IZ,
Federal Secretary, W.I.A.

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RESEARCH LABORATORIES' "OPEN DAY"

The Post Office Research Laboratories in Melbourne plans to hold an "Open Day" programme over a few days in September and it is thought it may interest readers of "A.R."

The Research Laboratories are at present carrying out more than 200 projects of varying magnitudes and a comprehensive exhibition of the work being done is planned for visitors.

The main concern of the Laboratories is to solve technical and research problems facing the Post Office.

Its work includes basic research and development in telecommunications theory and practice under Australian conditions, the design and development of telecommunications or mail-handling plant most suitable for Australia and an appraisal of world developments in telecommunications.

The Research Laboratories are housed in several buildings at the eastern end of the city and transport between buildings will be arranged by the Post Office. Inspection tours for visitors will begin at 59 Little Collins Street, Melbourne.

The timetable for the "Open Day" is:

Monday, September 15—
2 p.m. — 4.30 p.m.
Tuesday, September 16—
10 a.m. — 4.30 p.m.
7 p.m. — 9.30 p.m.
Wednesday, September 17—
10 a.m. — 4.30 p.m.
Thursday, September 18—
10 a.m. — 4.30 p.m.
(reserved for students)

For further information contact the Information Officer at the Research Laboratories—Melbourne 630-7932.

HAMADS

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Advertisements under this heading will be accepted only from Amateurs and S.w.l's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at **P.O. 36, East Melbourne, Vic., 3002,** by **5th of the month** and **remittance must accompany** the advertisement.

CHANGING QTH. Must sell. Antenna Tower, 60 ft. self supporting. Also Prop. Pitch Motor with cradle and control unit. TA-33 Junior Beam. All items in very good condx. Bob Glasser, VK3QA, 306 Wattletree Rd., East Malvern, Vic. Ph. 50-1409.

FOR SALE: Bendix Frequency Meter, BC221AK, complete with modulation, calibration book, earphones, and a.c./d.c. power supply, $55. Phone 560-0670 (Melbourne).

FOR SALE: FLDX-2000 Linear Amp. less than 20 hours' use, $220. Heathkit HW32A, 20M, 200w. p.e.p. s.s.b. Transceiver, includes plug-in 100 kc. xtal calibrator, $125. Heavy duty a.c. Power Supply for transceiver, $30. Heathkit SB610 Signal Monitor, $80. Heathkit HP10 12v. d.c. Mobile Power Supply, $20. 40 ft. crank-up galv. Antenna Tower, $30. CDR T.V. Antenna Rotator, $30. D. D. Kinnersley, VK4XI, 27 Oxley St., Edge Hill, Cairns, Qld., 4870. Phone 53-2068.

FOR SALE: G209 Geloso Receiver, excellent condition, unmarked, very little use, $90, or near offer. Original packing case on hand. VK4XS, L. J. Salter, P.O. Box 219, Kingaroy, Qld., 4610. Phone 973.

FOR SALE: Hallicrafters 5-band, s.s.b., c.w. Transceiver, Model SR150, complete with a.c. power supply, vox, p.t.t., 125 watts p.e.p. input, instructional manual, $350 o.n.o. VK1AN, 37 Ingamells St., Garran, A.C.T., 2605, or phone (062) 81-5905.

FOR SALE: Hammarlund SP600, JX21, 20 valves, six bands. 50 Mc. to 0.55 Mc., rack, clean and in excellent condition. Test any time. $360. Will trade. 1 Park St., Coledale, N.S.W., 2513 (near Wollongong). Phone Thirroul 541.

FOR SALE: Heathkit Apache Tx, five-band, with SB10 s.s.b. adaptor. Excellent condition. G. Whitby, VK3ADY, Ph. 848-3205 (home), 62-6025 (bus.) (Melbourne).

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FOR SALE: One Teletype Model 14 Tape Reader-Distributor, $30. One A.W.A. r.t.t.y. Terminal Unit (limiter-detector), Type IG72740 with meter and control unit in 2 ft. x 19 in. rack, $30. One Teletype Model 12 Tape Perforator, $15 (will consider swapping above for suitable Pen Recorder or general coverage H.F. Receiver). Two A.W.A. IG52740 r.t.t.y. Terminal Units, $15 each. One 465 Mc. Telemetry Transmitter, 5 watts, $10. One SCR522 Transmitter, modified for 2 mx a.m., metered, $15. One Marconi U.h.f. Wavemeter, 20-300 Mc., as new, $10. One A.W.A. AMR101 H.F. Receiver (like HRO and AR7), 3.5-15 Mc., with power supply and speaker, $65. One 44 in. Parabolic Reflector, aluminium, suit microwave, $15. One S.T.C. Polar Relay Testset, $4. R.t.t.y. gear: Teletype Model 15 Page Printer typing unit (only), Model 14 Typing Reperforator incomplete, several keyboards, etc. Many springs and other small bits; tubes, chassis, junk, all cheap. Geoff Thomson, 115 Hawdon St., Heidelberg, Vic., 3084. Phone 45-6734.

FOR SALE: Star SR550 Ham-Band Receiver, 160 to 6 metres, s.s.b.-c.w.-a.m., as new, $150. S.s.b. Transmitter, vox, p.t.t., c.w., 9 Mc. xtal filter, wants some work done on it, $75. Palec Tube Tester and Multimeter, $15. W. R. Jardine, P.O. Box 95, Leongatha, Vic., 3953. Phone 2711 evenings.

FOR SALE: Type "S" Power Supply, Modulator 807s p.p., 6 mx Tx, 2 mx Tx, both with xtals and 6/40 final; Tx's are interchangeable; $80. 2 mx Tx, fully metered, 6/40 final, $20. Pye 53.032 Mc. a.m., converted, with xtals, $20. D. Godfrey, P.O. Box 248, Moe, Vic., 3825.

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WANTED: Heath SB10 Sideband Adaptor to suit Apache Tx. Reply to B. Baker, 7 Kara St., East Doncaster, Vic., 3109. Phone A.H. 842-1938, Wk. 41-1246.

WANTED: R.C.A. AR88 Receiver in A1 condition, complete with instruction manual. Price and particulars to W. A. Halley, VK4TI, 1/24 Tarcoola Cres., Chevron Island, Qld., 4217.

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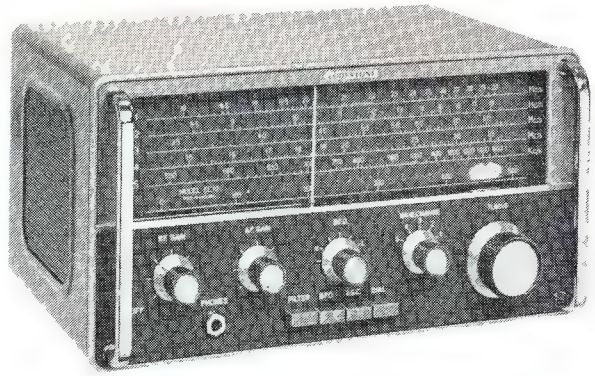

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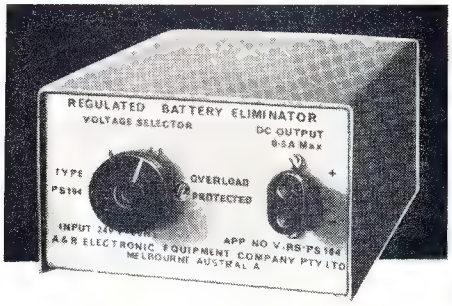

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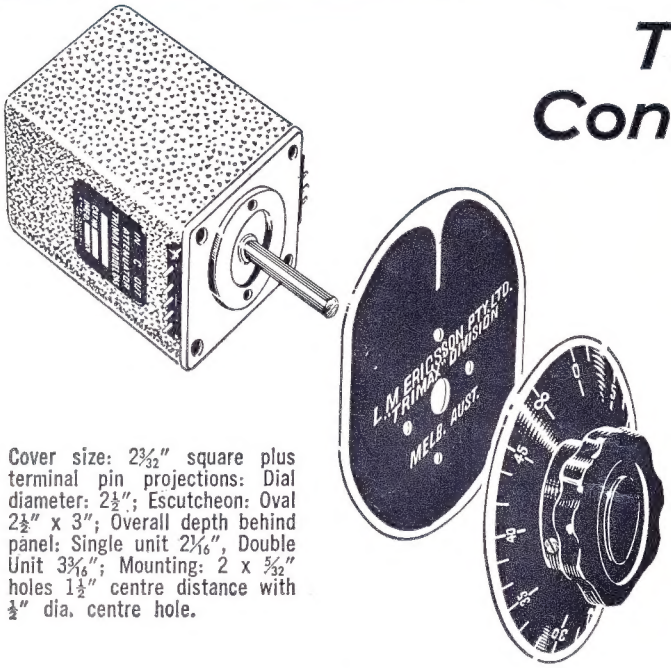

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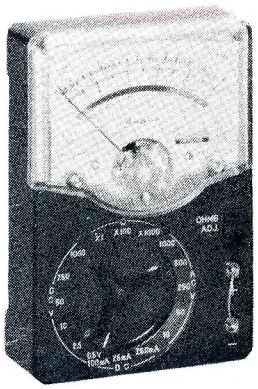

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0.1, 25, 250.
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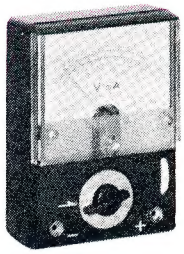

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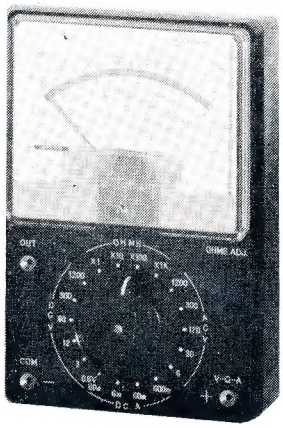

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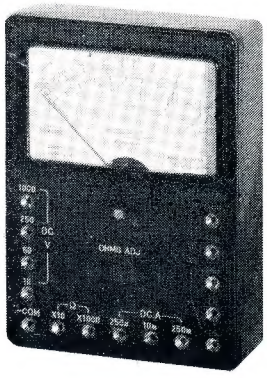

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10, 50, 250, 500, 1000.
0.25, 10, 250.
10Ω to 2 Meg. in two ranges.
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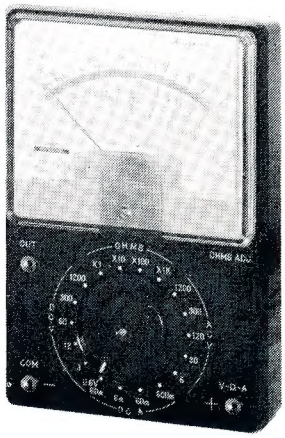

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0.06, 6, 60, 600.
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